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SEPTEMBER 1960

Volume 55 Number 10

THE UNIVERSITY OF MICHIGAN
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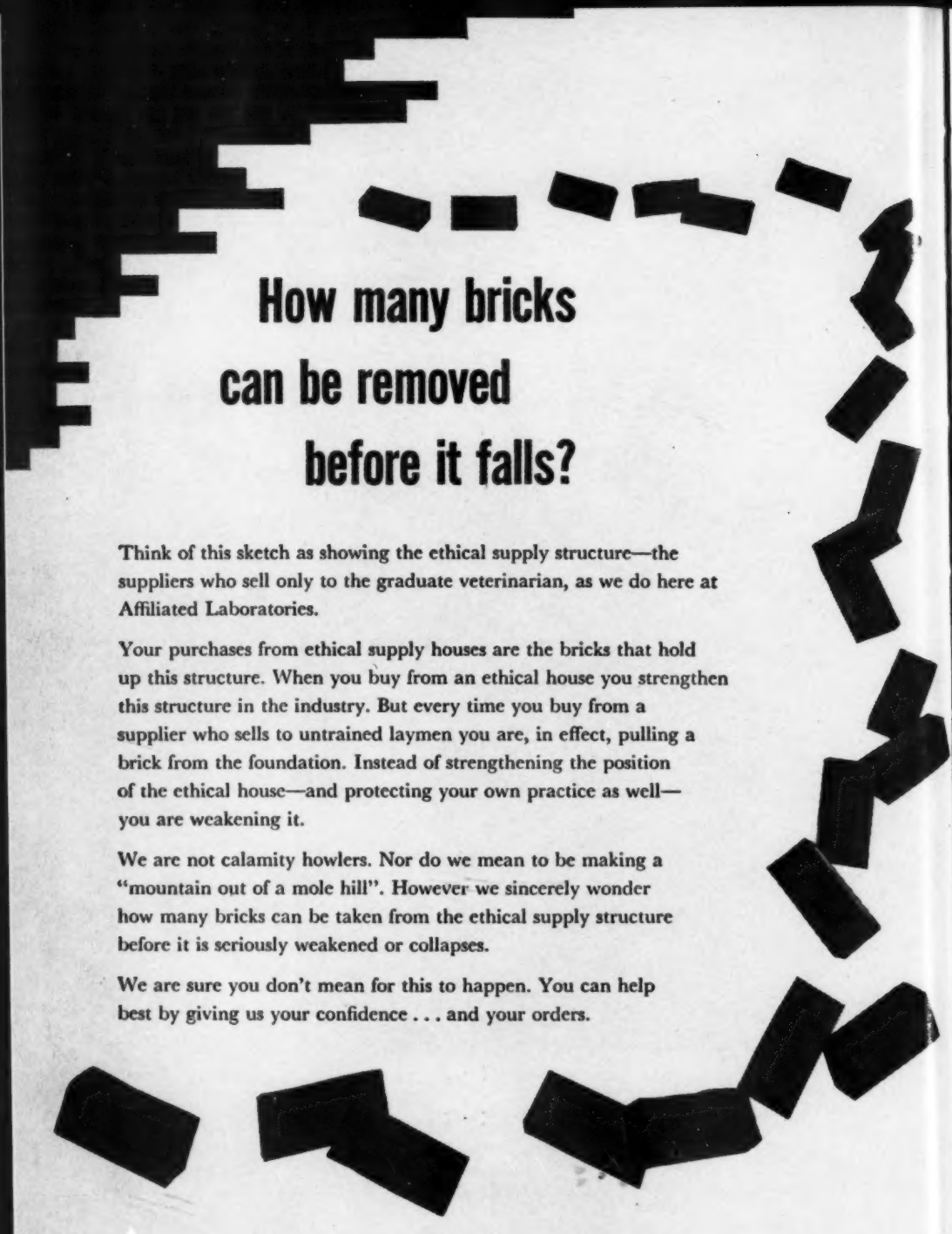

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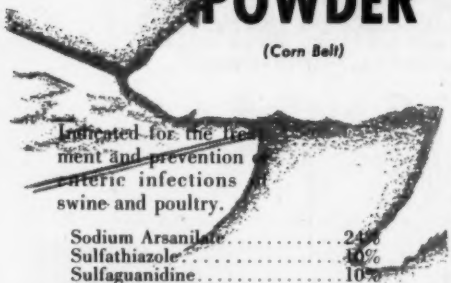

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VETERINARY MEDICINE

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The function of VETERINARY MEDICINE is to serve as an open forum (within ethical restrictions) . . . to act as a bridge between the conclusions of laboratory research and the experiences of successful clinical practice . . . and to lead, not push this profession, through accurate and sound reporting, in keeping abreast of the progress of veterinary science.

This is primarily a practitioner's journal, and its policy was clearly set forth by the late Dr. Anderes when he stated that VETERINARY MEDICINE is dedicated to explore every possible lead of potential value; encourage correspondence with the best qualified; keep alert to new ideas; sound out newer information, and present these items to the practitioner at the earliest possible date.

This has been the policy of this publication for 55 years, and it will be earnestly pursued in each coming year.

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NEWS COMMENT

Sex Determination Studies

Investigations at Columbia University continue to suggest that male and female producing sperm cells can be detected by physical differences. According to these studies, human semen contains sperm cells with small round heads and another type with larger elongated heads. The round headed sperm are believed to produce males and the elongated ones females. The most centrally located chromosome in each type of nucleus has the same size and shape relationships as the X and Y chromosomes in the cells from which the sperm developed.

F.D.A. on Ag. Chemicals

A recent report from the president's science advisor, Prof. Kistiakowsky, indicates that some easing of regulations on agricultural chemicals may be in the offing. If this report carries weight with FDA, chemicals will probably not be banned because they can cause cancer in laboratory animals under extreme conditions. The report suggested that scientists use judgment to decide what compounds might be a threat to human health.

Mites For Fly Control

A new approach to fly control may be offered by a mite small enough to hide under the head of a pin, according to University of Wyoming investigators. The mite feeds on flies and fly eggs. Insect control workers hope to "seed" mites in flies' breeding places to kill most flies before they mature.

Fresh Water from Sea

A new evaporating system soon to be built at Freeport, Texas will produce fresh water from the Gulf of Mexico for about $1 per 1,000 gal. By using the same design in a plant 10 times bigger, water could be produced at 35c per 1,000 gal.

Cigarettes and Coronaries

Smoking cigarettes increases blood pressure and heart output about 10% in coronary heart disease patients. Work of the left ventricle increases almost 50% according to Wayne State University workers. Uptake of oxygen by the heart muscle increases slightly or not at all.

Cat-Scratch Disease in Children

The oculoglandular form of cat-scratch disease is rare but according to University of Missouri M.D.'s it can occur in children. They described a case of an 11-year-old girl with conjunctival ulcer and preauricular lymph node enlargement after facial contact with a cat. Dermal reaction to cat-scratch antigen was positive. The lesions persisted for about two and one-half months.

Marketing of Cholera Serums

The Federal Register of July 9 presents detailed changes in the ARS Marketing regulations pertaining to handling of Anti-Hog Cholera Serum And Hog Cholera Virus. The order forbids the payment of patronage dividends based on purchases of serum or virus except by farmer cooperative association. This document represents the culmination of long term investigations and obviously is directed toward the veterinary owned cooperatives that deal in these government regulated products. Although this ruling extends the usual privileges to farmer cooperatives, recent actions against cooperative milk marketing organizations in the East suggest that even farmers will no longer be allowed to utilize the cooperative to create monopolies in the future.

Cattle Feeding Statistics

A report from the National Cottonseed Products Assn., Inc. states that a practical thumb rule in cattle feeding is that an animal on full feed will eat total monthly amounts equal to its body weight. Under average conditions, 500-lb. feeders will require 350 lb. of cottonseed hulls during 180 days in the feedlot. They should produce 400-500 lb. of feedlot gain depending on condition and inherent efficiency of the animals.

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How effective is Dioleen Suspension?
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EDITORIAL

Thanks for Your Help!

The problems of publishing a national journal in many ways parallel the problems of a practitioner with his clients on a grand scale. It's impossible to please everyone but close contact with the problems, seasoned with experience and willingness to adopt useful new procedures and technics, lets the practitioner serve the majority to their satisfaction.

Editorial success is dependent on identical principles. Although opinions and interests of veterinarians are many and conflicting, we rely heavily on frequent contacts with our readers to guide our course. We believe in serving, not pushing, our readers.

Your response to our recent questionnaire has been most gratifying and valuable. Our statisticians are dumbfounded, as we have tabulated around 20% of returns from 7,000 veterinarians polled and replies are still coming in. With this excellent response we are told that it will be possible to rather accurately pinpoint the interests and opinions of the entire profession and establish the reading interests of each area of specialization with a high degree of accuracy. In addition to the cold statistical value, the notes and suggestions you took time to write have stimulated a number of outstanding editorial ideas and have raised enthusiasm to a feverish pitch. One problem with a whole staff sneaking time to read hundreds of your notes is that the office looks like a GI mail call during war years. We are confident that time and effort will help us do a better job.

Preliminary Results

You may be interested to note that to date 98.5% of readers reporting find one or more interesting articles in each issue of V.M. and 1.5% do not. We have found that 27.8% reported they would like to see more emphasis on research information but 72.2% do not want additional coverage in this area.

More clinical case reports were requested by 84.7% while 15.3% said no. More information on laboratory procedures has been requested by 78.2% while 21.8% do not want more. Publication of VETERINARY MEDICINE on its present once a month basis is preferred by 83.2% while 16.8% would like to receive it more frequently.

General appearance, layout and readability of VETERINARY MEDICINE were classified very good by 98% of those reporting and 84.6% felt that general practice coverage was good or very good compared to 15.4% who classified it fair or poor. Small animal practice coverage was rated good to very good by 86.7% and fair to poor by 13.3%. New research coverage ranked good to very good with 73.6% and fair to poor by 26.4%.

The separate Small Animal Practice section received endorsement by 95.3% and was disliked by 4.7% of those reporting. Regular departments which lead in reader interest were Small Animal Clinic, which scored 72% "read often" and Practitioner's Laboratory, which showed that 74.6% read it often.

A substantial 62.3% reported that they would subscribe to a new exclusively Small Animal Journal, with only 37.7% indicating that they would not. Amazingly, 94.9% said they would continue to subscribe to all existing publications and only 5.1% felt they would drop one or more.

Suggestions

A few comments selected at random indicate the varied and interesting recommendations received.

"Your magazine is good but I would like to have a good Small Animal magazine."

"I think as much emphasis as possible should be placed on the emergence of a good small animal publication."

"Go jump in the lake."

"There is very little good practical information on horse practice in any journal — why don't you aim your program a bit more in this direction?"

"Since my practice is limited to small animals, naturally I turn to the Small Animal Practice section first. I am glad to note much improvement in this part of your journal and I also read the Small Animal Clinic section. I do get some good from articles in General features, but would subscribe to a strictly small animal journal. Can see much improvement in VETERINARY MEDICINE and no doubt will be a subscriber in the future as I have been for many years in the past."

"More emphasis on general practice; equine problems."

"I believe that eventually one publication for large animals and one for small animals will be inevitable."

"It would be very hard to improve upon this magazine, except perhaps to put more stress on economics in practice."

"Sure would like to see some journal give an occasional article on goats."

"Put more emphasis in the small animal section on geriatrics, orthopedic surgery and eye care."

"Devote a little more time to large animals — although somewhat extinct in the east, very prevalent here."

"Please support the standardization of procedures. Prices will follow. Try to impress veterinarians of their responsibility to clients; modern equipment needs, instead of how much can we charge."

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EQUINE PRACTICE

Although the profession has its historic foundation in the care of the horse and all veterinarians were well grounded in the basic principles of equine medicine, the sudden resurgence of horse practice has left many of us startled and a little short on confidence after many years without active contact with the horse. This was evidenced by the recent VM questionnaire, which revealed strong practitioner interest in more information on the horse. These requests specified more facts on routine procedures we have forgotten, not the unusual and off-beat cases. In an effort to fill this gap, we will present a series of condensed reviews covering fundamental technics of equine practice which will be supplemented by periodic articles by experienced equine practitioners.

Examination of the Mouth

A first consideration in examining the horse's mouth is the state of food and water intake. It must be remembered that animals readily eat feed which they are accustomed to, but a change of feed or feed source may be refused. Some animals drink soft water and refuse any change. Hay with foxtails and beards may make good looking feed yet be unpalatable and cause sore mouths. Loss of appetite is not necessarily a diagnostic sign but of value when considered with other observations.

Now that we are dealing primarily with inexperienced horse owners, we must be constantly alert for such problems as a halter that may prevent opening the mouth. The horse uses the lips in prehension. Vigor and frequency of mastication should always be noted and should normally be in the range of 60-100 movements per minute.

Salivation and failure to eat, with other signs lacking, usually point to mouth problems. Paralysis of tongue and cheeks is seen in the horse and may be associated with dental problems.

A rough examination of the teeth and mouth can be made without a speculum but detailed examination is impossible without suitable equipment. In observing the mouth one can expect to observe signs of catarrhal inflammation, nodules, ulcers, stomatitis of many kinds, wounds in the gums or intra-

dental spaces and at the lip commissures. It must be remembered that the horse can easily cut the tip of the tongue on the incisors.

Fracture of the premaxilla
Prognosis: Age is a factor. A simple fracture is favorable but a compound fracture is not.
Treatment: Drill between the teeth and close the separation of the premaxilla with copper wire. General anesthesia will permit replacing a transverse fracture and the teeth keep it in place. Minimum mastication problems are encountered by feeding soft food.

Injuries to the Interdental Space
Etiology: Bit injuries and sharp objects in the feed.
Signs: 1. Superficial—only mucous membranes cut, bruised or swelling. 2. Periosteum damaged—pain, swelling lasts longer and doesn't heal readily. If chronic, an exostosis will be observed. 3. Bone damage—necrosis, with bad odor accompanied by bone caries, sequestra. 4. Bone marrow—osteomyelitis occurs with thickening of the bone, often a discharging fistula into the mouth or elsewhere with no pain on mastication.
Prognosis: 1. Favorable; 2. Less favorable; 3. Poor; 4. Very poor.
Treatment: Remove the cause. Use a proper bit. (Rubber bit, straight bar bit with a large diameter.) If the bone is involved, remove sequestra, curette fistula, provide drainage and remove necrotic tissue.

General Signs of Dental Problems
1. Cautious mastication; 2. Quidding of food; 3. Sudden pause in mastication; 4. Food left in the mouth; 5. Salivation; 6. Nasal discharge, especially unilateral with no other cause noted. Generally a foul smelling pus in the sinus. 7. Carious odor—from decaying bone. 8. Lack of condition.

Irregularities in Teeth Development
Supernumerary teeth are common in the horse.
Signs: Often absent or quite general. They are found first on examination.
Prognosis: Depends on the degree of damage. Poor if necrosis present.
Treatment: Remove the tooth or cut it of and file. Temporary teeth often fail to shed There may be no signs and the treatmen is removal of the temporary teeth.

Displacement of Teeth
This is an anomaly of development affectin bone—not teeth.
Etiology: Unknown.
Signs: Parrot mouth (overshot) or under shot jaw. Causes difficult grazing in shor grass. Difficult prehension, but all right when hand fed.
Treatment: Stall feeding.

Irregularities in Wear of Teeth
The herbivorous tooth is more complex than the carnivorous. It has many complex folds, cement, denture, enamel. They wear at different rates, causing rough surfaces. They are wearing off constantly. The whole tooth extrudes with wear and the roots get shorter. Much lateral action causes extensive wear and the grinding surface must be kept sharp.

Angular—(Sharp mouth)
Very common in the horse. The tooth wears more on inside. No trouble unless sufficient to cut the cheek or tongue.
Etiology: Excess wear on inside of upper tooth and outside lower tooth.
Signs: 1. General dental symptoms; 2. Whole grain in feces; 3. Points seen on examination; 4. Abraided areas.
Prognosis: Favorable unless exaggerated.
Treatment: Remove points by floating.

Shear Mouth
Exaggeration of angular mouth.
Etiology: Lower jaw too narrow, any disturbance of action limiting lateral movement such as fracture or arthritis.
Signs: General dental symptoms, whole feed in the feces, feel teeth on examination.
Treatment: Soft feed, long grass, and attempt to remove points as much as possible.

Wave Mouth
Some teeth are longer or shorter than the rest.
Etiology: Unilateral wear or soft teeth.
Signs: General dental symptoms and examination.

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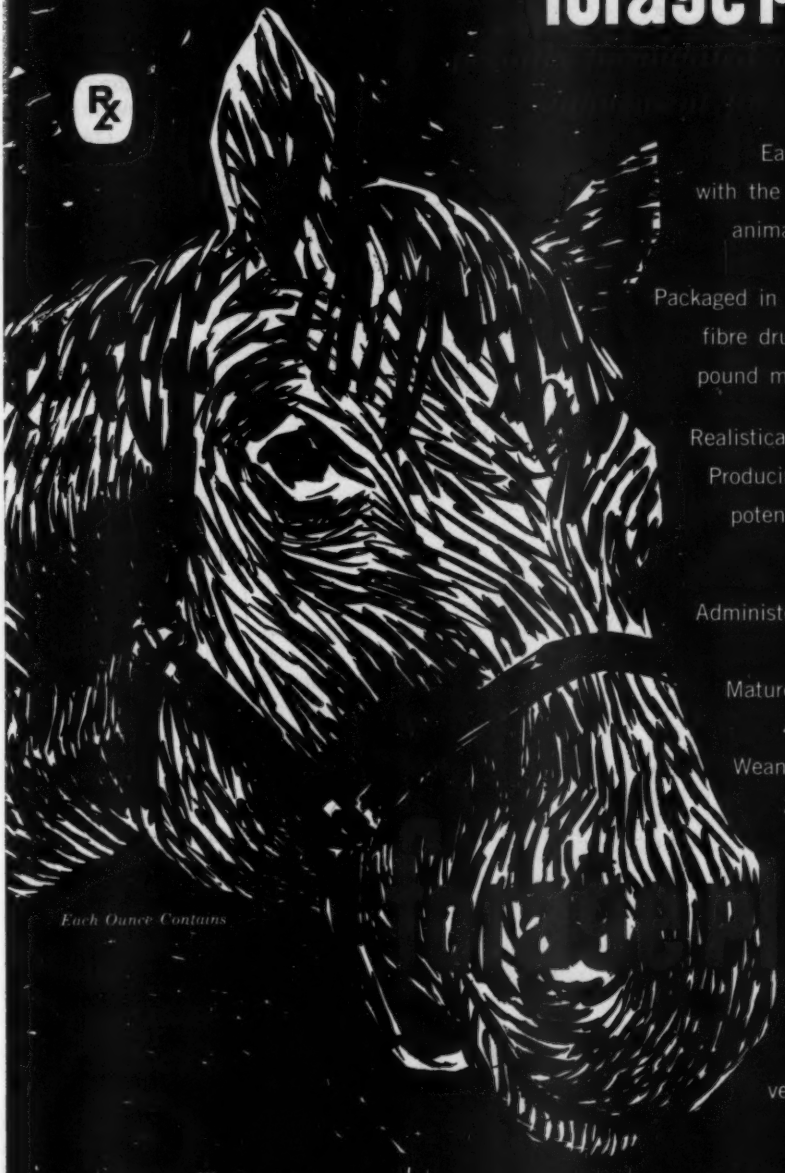

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Treatment: Smooth up points and give soft feed.

Step Mouth

Etiology: Uneven hardness of the teeth, diet, etc.

Signs: General dental symptoms, back teeth (6th) frequently involved.

Prognosis: Usually unfavorable unless caught early.

Treatment: Can usually cut or repel the long tooth if only one involved. If more are involved, it can't be corrected, especially in the older horse. Just smooth them up and place on soft food.

Premature Wear of Teeth

Etiology: Teeth may be soft from improper diet or inheritance. Sandy pasture area increases wear by as much as two years. Hybrid corn is hard and can add six months to a mouth.

Signs: General dental symptoms. Teeth all worn out at an early age.

Treatment: Soft food.

Smooth Mouth

No rough surfaces, enamel is soft.

Signs: General dental symptoms.

Treatment: None.

Diseases of the Tooth

Dental Tartar—Organic material plus inorganic salts and mucoids. Commonly seen in 6-8 year old horses. Causes little trouble and disappears in later life. Seldom seen after ten years of age.

Fissures in teeth

Etiology: Lack of tooth hardness, diet, inheritance. Biting hard objects may split the tooth. Disease of the alveolus may be involved.

Signs: General dental symptoms, crack in the tooth which rubs the cheek.

Prognosis: Favorable.

Treatment: Remove the whole tooth.

Dental Tumors (Odontoma)

Occurs rarely. Is often confused with inflammation of the tooth and bone.

Prognosis: Doubtful.

Treatment: Remove surgically.

Alveolar Periostitis

The gum and periosteum hold the tooth in place. If the gum recedes, infection enters the alveolus.

Etiology: Infection enters the alveolus through wounds of the gum, separation of gum, sharp particles of food, cracks and fissures in the teeth, fractures of the jaw, retention of temporary teeth, rarely through the blood stream but most commonly the result of failure of the central island of dentine to close, especially in young animals. Most frequently affects the fourth cheek tooth. Observed more frequently in certain areas, suggesting a dietary cause.

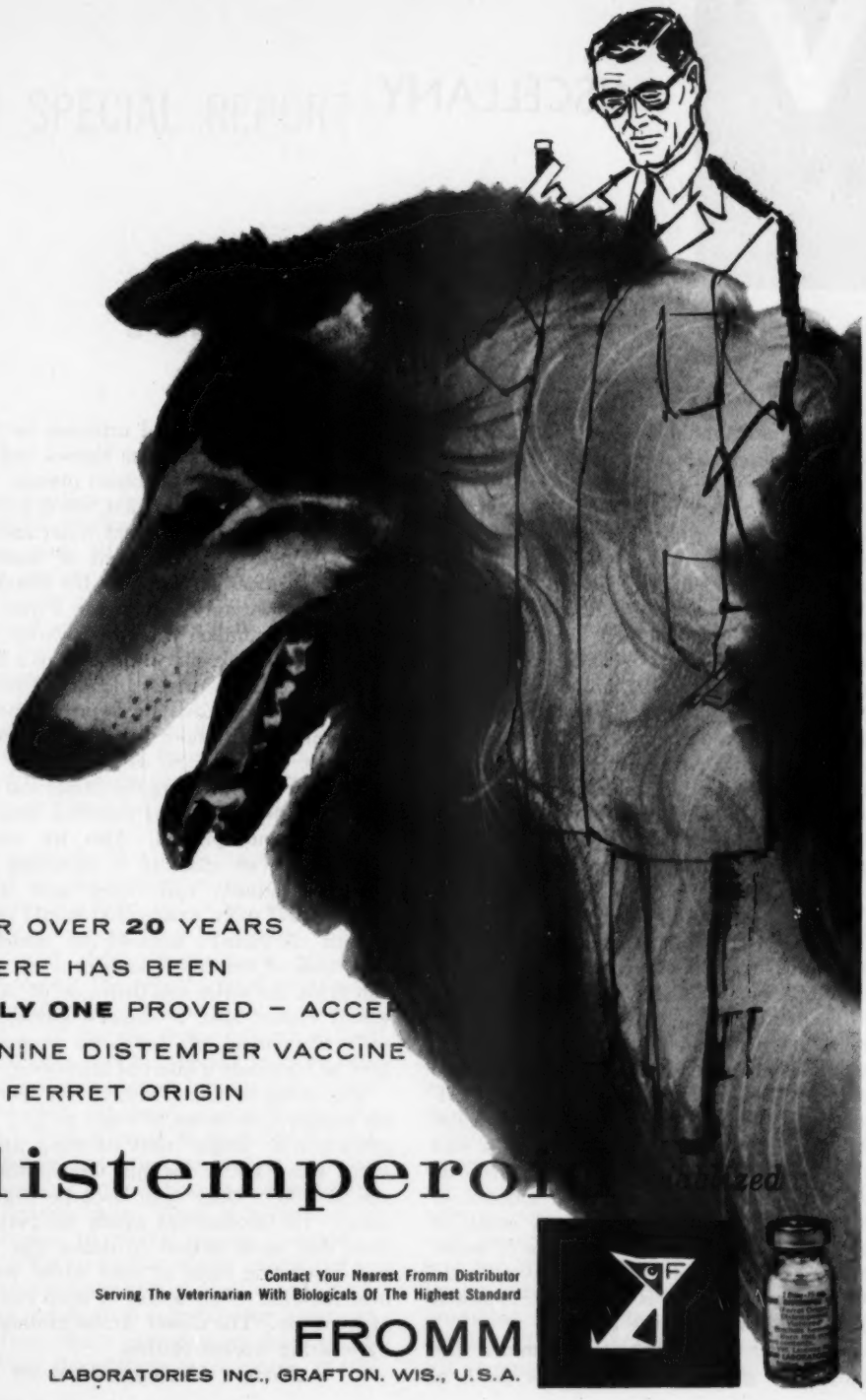
Signs: Chronic ossifying lesion is more common in young horses. Enlargement on the jaw around the alveolus appears quickly but develops slowly. It may be more of a general thickening in the lower jaw. It is generally painless on palpation, with little or no general dental symptoms noted. This condition may terminate in an acute suppurative condition or just stop.

An acute purulent condition may occur with a face fistula near the second cheek tooth. If the last four teeth are involved, pus goes into the sinus and nasal cavity. This condition is usually unilateral, as only one tooth is involved. It is typified by a thick malodorous pus commonly associated with decaying bone. In the lower jaw, a thickening usually occurs before the fistula forms. There is little damage to the visible tooth or gums, especially in the upper teeth, and few general dental symptoms.

A bony enlargement will indicate the involved tooth. The veterinarian should look for a loose tooth, a tooth out of line, any recession of the gum, softening of the gum or roughening of the tooth. When no definite symptoms could be detected many veterinarians in past years removed the fourth upper cheek tooth on the assumption that even though the tooth looked good, the drainage established helped clear up sinusitis.

Prognosis: Favorable unless too much bone involved.

Treatment: Remove the tooth by extraction or trephine the bone and repel the tooth.



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V MISCELLANY

Why a Camel Can Live Without Water

It is unfortunate that even some of our scientific literature remains full of things "that aren't so." I imagine all of us have been brought up on statements that the camel can live for days in a waterless desert because he stores water in his hump and in a pouch off of his stomach.

For years, Dr. Kurt Schmidt-Nielsen has been trying to get the facts about the physiology of camels, and recently, in order to get the information he wanted, he went to North Africa with a group of scientific workers. He reports that in the Sahara in winter grazing camels are not watered at all. They get enough water from the shrubs on which they feed. He saw some camels that had had no water for two months and yet refused a drink when it was offered them.

In the hot dry summer, the animal has to drink after about a week. In summer, Schmidt-Nielsen kept a camel without water for eight days. By that time, it had lost a fifth of its weight. It looked bad; it looked very thin; its ribs stuck out, but it was not sick. When given water, in ten minutes such a camel will gulp down some 27 gallons, and promptly his body fills out again. An interesting point is that he drinks just enough to restore his original weight; he does not try to store an extra amount of fluid for a future emergency. A study of butchered camels showed no store of water in the hump and very little in the stomach. The important point is that water is stored in all the tissues of the animal.

The main reason why, in summer, the camel can go so long without a drink is that, as he perspires and urinates, he takes the water mainly from his tissues and not, as a man does, from his blood plasma. The research workers found that when a camel had gone for a week without water and had lost a fourth of the amount of water he normally carries in his body, his blood volume was down only a tenth. In a man subjected to a similar water deprivation in a hot desert, the plasma volume drops a third, and, with this, the man's blood will become so viscous it will circulate so poorly that his temperature will shoot up; he will become delirious, and soon he will be dead.

Another helpful thing the camel can do is to keep reprocessing his excreted urea and turning it into protein. Also, the camel's kidneys are so efficient in handling salts that the animal can drink and utilize "bitter" and salty waters that would poison a man. A camel's kidneys are something like those of the desert kangaroo rat which can drink sea water and thrive on it! As one would expect also, a camel's kidneys are very economical of water—so economical that he loses only a quart of urine every day.

The camel is helped also by the fact that his temperature drops at night to 93°. This gives him a "break" next morning when it takes some hours for his temperature to rise to 105°. Only then does he begin to sweat. He economizes much on perspiration; and he is helped in doing this by a heat-insulating layer of wool which he has over his hide. This serves to keep heat out of his body. The desert Arabs imitate him by wearing woolen clothes.

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VM SPECIAL REPORT

Economics in a Dairy Herd

Veterinarians need to have on "their fingertips" production costs, costs due to disease and other facts that they can use to explain to dairymen the merits of herd health programs. Producers are not impressed with figures such as 250 million annual loss due to mastitis or $100,000 due to leptospirosis or that the average livestock farmer loses $1,500 annually due to disease. Frequently, they refer to those loses as those experienced only by their neighbors. However, if these losses can be explained on a herd basis (their herd), they are more impressed.

For example, if a point needs to be explained on the economics of reproductive efficiency in a herd, it can be based on the interval of calving on a herd basis. Economists and dairy husbandmen calculate that it costs in the neighborhood of 50 cents to one dollar a day to carry a cow over the period of 12 months if she has not calved. (A profitable cow is expected to calve once a year, milking around nine months to ten months with at least a six weeks dry period.) This is based on what feed it takes, plus loss of potential production and loss of calves that are not born periodically and on a regular basis. Thus, if a herd of 50 cows has a 13 month calving interval, a loss of $750 to $1,500 can be calculated on the above method of figuring losses.

Several dairymen calculate the losses suffered from faulty reproductive rates by determining the difference in value of the cows sold for beef and the cost of replacement cows. If the average dairy cow sells for meat at $200 and the replacement cow costs $300, the differential is $100. The average cow stays in a herd for three years and, of course, this time could be extended with proper management. Using this system of calculations, a dairyman who has a 20 percent replacement annually, and by the use of an all-out herd management program, reduces this to ten percent or less, readily justifies the expense of veterinary services.

The same procedure may be used on a mastitis control program. Several studies show that mastitis reduces production as much as 20 percent. This loss, plus the costs of drugs and the decreased value of cows affected by mastitis, may cost from $1 per cow per month to several dollars per month depending upon the severity of the infection. A veterinarian who treats only the infected quarters without setting up an all-out prevention program will not control mastitis in a herd; consequently, he cannot show the herd owner increase in profits.

Dairymen not on production testing programs find it difficult to determine if they are making money over feed costs. The average cow producing 10,000 pounds of milk should yield over $2.50 for every $1.00 invested in feed. In many herds the return for labor is so small that it would be more profitable for the dairyman to go out of business. This type of dairyman needs help, but it must be remembered that there are

few real dairymen. Too frequently, they are just cow owners. Veterinarians will find it profitable to encourage their dairymen to adopt production testing programs for their herds.

Records are mandatory for both the veterinarian and the herd owner in order to account for changes in the herd.

A suggestion for record keeping, particularly for those affecting reproduction, is the use of 5″ x 8″ ruled cards that can be obtained at any stationery store. Steel or wood boxes of equal size can be obtained for storing these cards. The cards may be tabbed with the chain number or other identification so that the record of an individual cow can be easily found. The front phase of the card can be used for reproduction and the back side for mastitis and other treatment notations.

These cards can be readily carried in the barn or yard and if stored in dust-free, moisture-free boxes, can be kept for a long period of time.

(FRONT)

Queen Mary 3rd Chain #32 Tatoo 6972 Ear Tag 3262
Birth Date January 2, 1957 Sire H 32 Dam Queen Mary

	1958	1959	1960	1961	1962
January		C-3	T-5 T-7		
February	H-2 H-24		H-21		
March	H-14 Ba-31	H-8 H-29	H-12		
April	Ba-21	Ba-20	Bn-1 Bx-22		
May					
June	P-3	P-17			
July			P-6		
August					
September					
October					
November					
December		C-26			

Code = H—heat, C—calved
BN = breed naturally, BA = breed artificially
P = pregnancy check, T = treatment

(BACK)

Treatment Record

Date 1/5/60 Metritis—intrauterine infusion, Nolvasan
1/7/60 Metritis—intrauterine infusion, Nolvasan

MASTITIS RECORD

Date	RR	LR	CMT Test RF	CMT Test LF	Bacteriological Examination	Treatment	Results
July 16, 1969	0	0	0	0	Left front strep agl.		neg
May 2, 1960	1	1	3	5	Right front strep agl.	20,000 units pen	May 5 CMT

Bovine Ketosis—Preventive Measures

L. S. NILSSON, JR., V.M.D.
Belvidere, New Jersey

Ketosis by definition means merely the accumulation of ketone bodies in the tissues and body fluids. It may only be a clinical sign and can occur in conjunction with many diseases; but this phenomenon is so characteristic of a disturbance in the recently freshened dairy cow that we are justified in using the term *ketosis* to indicate a separate entity.

At present there are two schools of thought relative to the etiologic factors in *ketosis*: (a) nutritional[5,6,9,10,16,17,21,23,25,26,28,30] and (b) endocrine[12,24]—either a deficiency or a metabolic disease. Herein the discussion is limited to a consideration of the nutritional aspects. The writer believes that management practices have not kept pace with the increased milk producing capacity of the dairy cow. Some of our methods of feeding and husbandry will be examined in an effort to see what responsibility they bear for the increase in the number of *ketosis* cases which have followed their widespread adoption.

Feeding According to Milk Yield

Inadequate feeding in relation to the nutritional requirements of the parturient dairy cow is not necessarily followed by clinical *ketosis*. In many instances milk production, which is the prime drain on energy requirements, will promptly drop in response to an inadequate intake of feed.[1,11] Some of these animals will have low blood sugar levels and high levels of ketones without the clinical signs of *ketosis*.[28] It may be that the greatest loss from *ketosis* is from the subclinical case in which the cow milks below her optimum level—never hitting her potential peak or daily declining in such slight amounts that they are unappreciated.[15] However, the cow which develops clinical *ketosis* is the one with milking ability such that her production is maintained or even increased, despite insufficient feed intake. Yet, if the feed intake is inadequate, there is a disparity between the energy requirements for maintenance and milk production and the amount and efficiency of feedstuff conversion to meet these energy requirements.[29] The results are lowered production, *ketosis*, or both, and in essence they are compensatory adjustments in response to the deficient nutritive status.[6]

Whether the health and well-being of the dairy cow is affected adversely as a result of "high production" depends a great deal on the individual animal. Feeding according to yield, a modern dairy practice which should be followed, may not be adequate for all animals even if the recommendations of the National Council are followed.[26] Where the feeding standards have been elevated in herds having a high

incidence of *ketosis*, the results have been extremely rewarding.[8,23] Nevertheless, individuality is extremely important in preventing metabolic disturbances of high producing cows and our attention should be directed to the following:

1. Adequate feed intake based on the production and maintenance requirements of each animal.
2. An appreciation of individual preferences for certain dietary constituents in order to maintain and encourage a good appetite.
3. The feed consuming capacity of the individual to keep her on feed.
4. The importance of roughage, which is essential to the ruminant system of digestion, to balance the large quantity of heavy concentrates necessary to meet production needs and to prevent digestive disturbances.

The following are rules of thumb in dairy feeding which may help the dairy practitioner evaluate a client's feeding program. They serve as a basis for computing the general feeding program in the dairy herd. Individual requirements can be reckoned with by additions to or variations in the general feeding program.

Higher levels of feeding may not appeal to all dairymen, but where the herd is capable of giving a higher yield in response to better management and increased feeding, the additional yield will more than repay the farmer for the higher total feed costs.

TABLE No. 1
Feeding Rules

ROUGHAGES—feed liberally and on the basis of the animal's body weight, i.e.,

1. Corn Silage—3-3.5 lbs./cwt.
   Hay—1.1-1.2 lbs./cwt.
2. Grass Silage—4 lbs./cwt.
   Hay (high level)—1.1 lbs./cwt.
3. Grass Silage—6 lbs./cwt.
   Hay (low level)—.6-.8 lbs./cwt.

GRAIN—feed according to milk production (lbs. of feed to lbs. of milk), i.e.,

Holstein	—1:4	Min. ratio
Guernsey	—1:3	
Jersey	—1:2.5	

PROTEIN LEVEL of the grain should be related to the quality of roughage offered, i.e.,

14%	Protein	cum	Corn Silage	&	Legume Hay
16%	"	"	" "	"	Mixed "
18%	"	"	" "	"	Grass "
12%	"	"	Alfalfa Silage	"	Legume "
14%	"	"	" "	"	Mixed "
16%	"	"	" "	"	Grass "
14%	"	"	Mixed Grass Silage	"	Legume "
16%	"	"	" " "	"	Mixed "
18%	"	"	" " "	"	Grass "
16%	"	"	Grass Silage	"	Legume "
18%	"	"	" "	"	Mixed "
20%	"	"	" "	"	Grass "
16%	"	"	No Silage & Alfalfa (2.2 lbs./cwt.)		
16%	"	"	" " " Legume " " "		
18%	"	"	" " " Mixed " " "		
20-24%	"	"	" " " Timothy " " "		

Feeding Frequency

Frequent and uniform periods of eating and ruminating are necessary for uniform nutrition of paunch organisms and consequently, a uniform absorption of food elements by the cow.[20] Feeding twice or even three times a day, regardless of how much is consumed, is a practice which does not conform with the natural short but frequent eating, resting and ruminating periods which are evidently the normal feeding habits of the dairy cow on pasture. If the cow is allowed a choice of quantity and variety in her diet, she regulates the frequency of intake in a fairly uniform manner. Instead of taking our cue from the above we arbitrarily feed our dairy animals to suit our work day, with the result that they are subject to periods of mild starvation between two periods of plenty. In the adult cow it follows that the animals go off feed simply because of the inability of the rumen microorganisms to quickly cope with these periods of feast and

famine. Of special importance is the feeding of large amounts of grain and it is wise to divide it into smaller portions and to feed it more frequently.

Feeding the Non-Lactating Cow

The manner in which the average cow is fed is often deplorable. The dairy cow's diet is usually changed at least twice within a period of two months. At the end of her lactation, the grain supplement is decreased or completely discontinued. If drying off occurs during the stabling season, she is expected to subsist solely on poor roughage and if it occurs during the pasture season, on poor quality pasture. Both of these diets are often nutritionally inadequate. They are particularly low in the protein content, and protein is equally as important to the dry cow as to the lactating cow.[16] Old roughage or poor pasture may be a source of little more than calories and in the dry cow such a diet results in excessive fat deposition. This same cow may appear to be in high condition or well nourished, yet she is shortchanged nutritionally and often develops a severe case of *ketosis* shortly after freshening.[15,23] Throughout pregnancy the highest possible level of nutrition should be maintained.

Once lactation ceases the cow should be returned to a regular feeding program. During the barn feeding season no better ration can be provided than good legume hay and silage, if the latter is available, with enough concentrate to get the cow in proper condition before she freshens.[19] Depending on the nature of the roughage available and the condition of the animal, concentrates in the realm of 6 to 10 lbs. per day are considered adequate.

During the pasture season, if forage is plentiful, no additional feed is needed.[19] However, how often is the non-lactating cow offered forage that is plentiful? Usually the best pasture forage is harvested as hay and the hilly or marshy marginal land becomes the pasture. The diet of the cow under these circumstances needs to be supplemented. If she is kept with the milking herd on pasture, then it is obviously no problem to supplement her diet by feeding her with the others. If she is separated from the herd, then feed must either be taken to her or she must be brought into the barn and fed at least once daily in order that her diet may be balanced and adequate. The net returns from good cows are undoubtedly increased when they are so fed during the dry period that at calving they are in thrifty condition and carry a reasonable amount of flesh.[19] This increased worth of the well-fed dry cow may in part be related to her being able to meet the stress episode initiated by parturition and lactation without succumbing to *ketosis*.

In Britain today "steaming-up" or high-level feeding before calving is a recognized practice.[3] The effects of additional feed given in late pregnancy usually result in higher milk production. The effects are physiological and related to (a) increased body reserves at calving and for subsequent milk production, (b) increased development of the mammary gland (c) and increased food intake in early lactation owing to the cow's being accustomed to eating larger units before parturition.[4]

Feeding the Cow After Parturition

The antiquated feeding practices just prior to and after parturition are in the writer's opinion the key to the nutritional deficiency underlying *ketosis*. It reflects a general misconception of the nutritional requirements of pregnancy and lactation. At parturition and with the onset of lactation, the dairy cow's nutritive and metabolic requirements are increased at least 100 percent—due to the loss of sugar, protein, and fat in the milk and to the increased metabolic work of calving. Twenty pounds of quality milk represents about 1 pound of glucose, 0.8 pounds of fat and 0.7 pounds of protein (colostrum milk is ten times as concentrated in certain proteins) which are withdrawn from the animal's available resources. If the dietary intake is adequate, the animal remains normal; if the diet is not

sufficient to maintain normal levels of blood glucose and liver glycogen, a metabolic imbalance results. Thus if the diet is inadequate, we are initiating a syndrome *(ketosis)* to which the lactating cow is particularly susceptible.[17]

In view of the above considerations, the practice of "cooling off" a cow by cutting down on her feed allowances just before parturition and our reluctance to increase them afterward appears to be quite unsound.[6,18,19,28] These practices are defended by the dairyman because heavy feeding at this time is thought to (a) damage the udder from undue swelling, (b) contribute to mastitis, and (c) cause the cow to "peak" too rapidly and not "hold up" on her milk production and "burn out" at an early age.

It is not necessary here to enumerate the fallacies involved in each misconception but the following may be especially pertinent. A significant relationship appears to exist between the incidence and severity of udder edema and the level of protein feeding.[6] As an explanation for parturient udder edema it has been suggested that there appears to be a direct correlation between udder edema and a characteristic drop in the serum protein levels of the blood at parturition.[13,14] This drop in the blood serum protein levels is greatest in heifers. High producing animals tend to transfer more blood proteins to the colostrum with a resultant decrease in osmotic plasma pressure and greater observable udder edema. In a limited study, this process has been reversed in animals by the intravenous infusion of serum albumin.[14] This method of handling the problem is, of course, economically impractical. However, there may be a practical answer which is quite contrary to our present thinking. Beginning six weeks before calving, heifers in a feeding experiment were fed six pounds of soybean oil meal daily in addition to good quality hay. Although this did not increase the blood level of protein, none of the tested animals developed severe cases of udder edema.[14] Further studies on the feeding of high levels of protein at parturition may one day confirm the opinion of a few that this is the way to control udder edema. For the present at least, we can follow the recommendations of our colleagues who advocate bringing the fresh dairy cow on full feed as quickly as possible.[7,9,15,16,17,18,21,28]

Milking At Parturition

When we consider the ability of the high producing cow to shift from little or no milk production to full production in a short time after calving, and the energy needed to satisfy this phenomen, it *is* surprising that the incidence of nutritional deficiency (*ketosis*) is not greater. In many instances the dairy cow may reach her peak production in ten to 15 days after parturition (see Figure 1) as a result of frequent and thorough milking. In most states the lactiferous secretions of dairy cows are legally excluded from the market until five

Figure No. 1

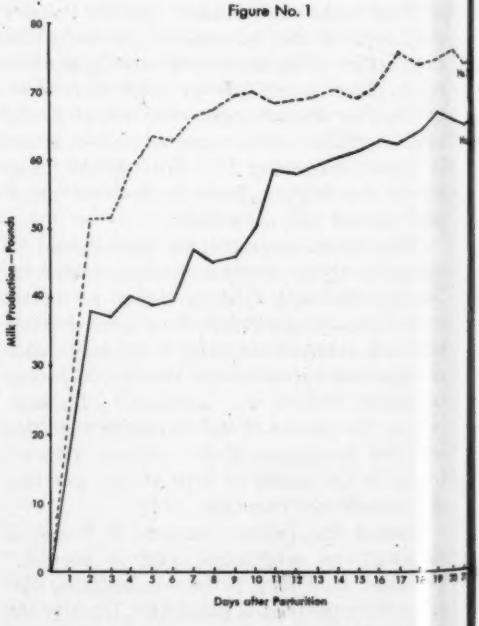

Fig. 1. Daily milk production of two cows chosen at random for the first three weeks of their lactation. Note high level of production at 10-15 days.

to seven days after calving. Therefore, if the udder is sound and free of mastitis, why do we persist in completely draining the udder of all its milk from the very first milking?

A harmless procedure which will make the transition far more gradual and be extremely beneficial to the cow is to practice incomplete milking for the first few days after freshening.[28] This will permit the feed intake to balance the nutritive requirements of the fresh cow, helping to insure a positive metabolic balance at the start of the lactation. Specifically, why not, for the first two days, milk out only enough to relieve udder pressure? Then, for the next couple of days, milk the cow with a full hand or machine without stripping or complete emptying. If the animal is to eventually be milked three or four times daily, why not milk her just twice daily for the next two to three days?

Changes in the Diet

The normal flora and fauna of the rumen is a dynamic population capable of major shifts in number and kind to meet most dietary alterations. Yet, dietary changes are not made without a detrimental effect upon the rumen microorganisms and a subsequent disturbance of the normal fermentation process—until adaptation is complete.[1] Meanwhile, during this time lag, the rumen *p*H may be altered, amino acid synthesis may be retarded and protein decomposition products may accumulate and their absorption can have an adverse effect on an already overtaxed liver. It is doubtful whether we can improve on the efficiency of the fermentative system of the rumen, but we can do a great deal to keep it constantly working at top efficiency if we simply don't disturb the process. Infrequent feeding has the same effect as sudden changes in the feeds offered.

Other dietary changes frequently practiced are: sudden feeding of grain after a period of time on pasture, turning out to lush pastures without first being fed dry matter, sudden changes to palatable silages, sudden changes in the grain ration (if only in physical consistency) and the deletion of dry roughages from the diet during the pasture season. Even lush pasture may contribute to *ketosis*, preceded by digestive upsets, enteritis and scours.[18] Many of these changes are necessary but every effort should be made to bring them about gradually. Gradual dietary changes are of benefit to the dry cow, especially if she has been existing solely on pasture. Certainly supplementation of her diet should be started a couple of weeks prior to freshening to avoid the ill effects of changes in the diet which may follow parturition.

Exercise for the Dairy Cow

A great variety of reasons corroborates a belief in the importance of regular exercise to the stabled dairy cow. One which is somewhat obscure may be its beneficial effect in the prevention of *ketosis*.[21] One investigation at least supports this view, and it has shown that in the normal dairy cow exercise increases the utilization of ketone bodies nearly ten percent.[5] In another investigation the exercising of ten ketotic patients for 30 to 60 minutes resulted in the average decrease in the acetone blood level from 28.7 mg./100 ml. to 22.4 mg./100 ml. and at the same time the blood glucose level was elevated from 30 mg./100 ml. to 50 mg./100 ml.[27] It must not be construed that exercise cures *ketosis!* Exercise, an energy-consuming activity, would be expected to be detrimental, and the effects mentioned above are a natural consequence of exercise in any animal. A cow with *ketosis* would seem to need absolute rest to conserve energy. However, the beneficial influence of daily exercise throughout the year has been demonstrated by reference to milk yield and composition, food utilization, and blood composition (hemoglobin, glucose, catalase activity, cholesterol and alkaline reserve).[25]

Seasonal Incidence

Emphasis has been placed on the seasonal frequency of *ketosis*. The high incidence of

ketosis during a particular season is merely coincidental and no cause and effect relationship exists. Most dairymen breed for seasonal calving and subsequent seasonal milk production. It thereby follows that *ketosis* is a relatively seasonal disease. The monthly distribution of the freshenings of over 400 dairy cows (excluding first-calf heifers) in one dairy herd during 1958 is shown (Figure 2). The herd is located in the northeastern part of the United States where dairy animals are stabled during the winter and pastured during the summer. The only operational variation which differs from the usual dairy practices is the milking and feeding of the animals three times daily, by hand. Though the incidence of *ketosis* varies somewhat from month to month, there is no significant relationship to any particular season. However, there is a definite and direct relationship between parturition and the incidence of *ketosis* and a goodly number (43 percent) of the *ketosis* cases occur within ten days following parturition. It is with the latter point that the practices discussed herein can be expected to have their greatest effects in preventing *ketosis*. Their adoption can significantly reduce the incidence of *ketosis* in our dairy herds.

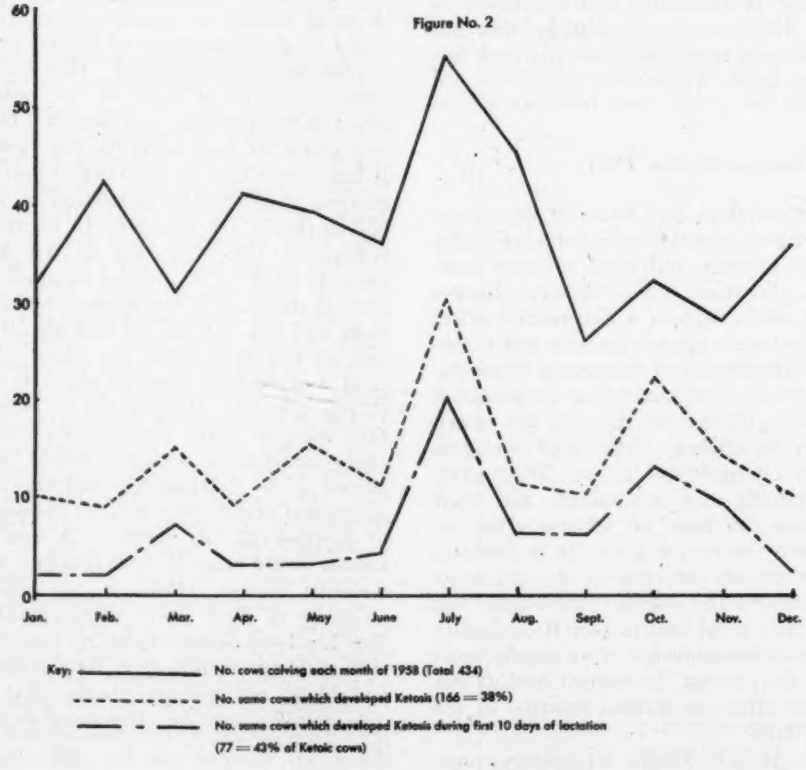

Fig. 2. Number of dairy cows calving in a large herd during each month of 1958 — also the corresponding number of these animals which later required treatment for ketosis — and which became ketotic during the first ten days after parturition.

Summary and Conclusions

The most important measure in the management of *ketosis* is accurate and early diagnosis with prompt and sustained treatment. However, since metabolic diseases are largely man-made, in that they result from increased production demands, veterinarians should be reasonably sure that the methods of management are satisfactory to meet these demands. What feedstuffs should be fed, when, how much, how, etc., are matters on which we should be able to advise our client. They can help him to reduce the incidence of *ketosis* without reducing production — they should, in fact, result in increased production.

1. *Feed According to Yield* — Make quality roughage the basis of the feeding program — feed liberally and according to body weight. The amount of grain supplement fed should be related to milk production, and the protein level should be determined by the quality of roughage on hand (see Table No. 1).

2. *Feeding Frequency*—When large quantities are required, by all means divide the daily ration requirements into smaller portions and feed them more frequently each day.

3. *Feeding the Non-lactating Cow*—Continue with the same quality roughage offered the milking cow. When stabled, feed her six to ten pounds of grain daily and supplement her diet when on pasture if forage is anything less than abundant.

4. *Feeding the Fresh Cow* — Step up the ration after calving. Offer her feed slightly in excess of that which she will clean up between feedings. When the peak of production is reached and levels out, feed according to production (see Table No. 1).

5. *Milking the Fresh Cow* — Practice incomplete milking for the first few days after calving. This appears quite practical unless mastitis is evident, then complete and frequent milking along with treatment is of primary importance and an attempt to prevent *ketosis* is secondary.

6. *Changes in the Diet* — The addition or deletion of all dietary ingredients should be made gradually. The only exception may be during the dried-off period. Avoid the introduction of unpalatable feedstuffs, for the failure to eat for even one day may upset the balance.

7. *Exercise the Cow* — Every cow, including the ketotic patient, should be permitted exercise each day except in severely inclement weather or when ice is covering the ground.

The practices herein advocated can mean greater economic gains to all dairymen. The incidence of subclinical *ketosis* is quite high, and while the animal's life may not be endangered, it does cause a great depression in milk production. High ketone levels are indicative of subnormal health; therefore, any system of management that reduces the incidence of *ketosis* is favorable to the maintenance of bodily fitness.

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Treatment of blood with the disodium salt of ethylenediamine tetraacetic acid permits accurate estimation of erythrocyte sedimentation rate after short storage of blood samples. Results with samples kept up to six hours at room temperature or twenty-four hours in a refrigerator are not appreciably different from those immediately after withdrawal, report Ian D. Melville, M.B., and Basil M. Rifkind, M.B., of the Royal Infirmary, Glasgow. Further delay greatly retards values. Shaking the sample at intervals during storage at room temperature does not affect results, provided mixing is thorough before estimation. The disodium compound is used in a concentration of 1 mg. per cc. of blood.

Brit. M. J. 5166:107-109, 1960.

Clinical Hints

Small umbilical hernias in young gilt and boar pigs can be reduced nonsurgically by painting them with nitric acid. Apply the acid with a cloth or cotton swab till the skin turns yellow and repeat in a week if needed. Be sure to treat only the reducible hernias and advise clients to avoid keeping treated pigs for breeding stock.

Pigs that start to cough shortly after birth and develop a chronic cough may respond to vitamin A supplements.

Pasteurella bronchisepticus may be isolated from the lungs of many little pigs showing a chronic cough comparable to human whooping cough. This organism has been incorporated in canine mixed bacterins for years and their use has been reported of value in controlling this type of infection in pigs. Two doses are given in bred sows.

Orphan pigs may be fed cow's milk containing eight to ten percent fat. Each pig

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GENERAL PRACTICE TOPICS

should receive two oz. every three or four hours.

Little or no diarrhea may be noted in calves heavily infected with stomach worms. Presence of "wire worms" belonging to the Cooperia or Ostertagii species may be overlooked as a cause of cattle losses unless a section of the gut wall is scraped and the scrapings strained through a fine screen after ample dilution with water.

Teat Surgery Tips

The three most important prerequisites for successful teat surgery are proper restraint, anesthesia, and aseptic technic.

With Hard Milkers: Operate with the udder full of milk. Make four cuts of the sphincter with a Case or Lichty bistoury, being careful not to cut the skin. When done correctly, the teat should drip milk. To avoid trouble from postoperative blood clot, milk out every few minutes.

Teat End Injuries: For minor injuries use an Ohio teat tube and tape it in place, taking off cap of tube when milking. When the teat end has suffered severe injury, amputate with a Bard-Parker blade or new safety razor blade. Some like to crimp the teat above the injury with a lamb-size emasculator, then amputate.

Perforating Teat Wounds: Observe aseptic preparation and debride wound edges

This handy swine crate serves well in the clinic of Dr. W. W. Leatherwood, Salisbury, Missouri. Equipped with quick opening front as well as rear gate, it serves excellently for bleeding and examination work on the farm and in the hospital.

if ragged. Approximate mucous membrane with closely placed interrupted stitches of very fine catgut. Use metal suture clips on skin. In selected cases insert a William's cecal trocar diagonally into milk cistern on medial side of quarter and hold in place with skin clips. Use Ohio tube in teat orifice.

Acorn Poisoning

The time is approaching when pastures are cropped close and acorn poisoning is encountered in cattle. Symptoms are prostration, subnormal temperature, grinding the teeth, atony of the forestomachs and dull, sunken eyes. The tail and perineum are usually matted with black, semiliquid feces. Considerable straining is often noted.

Autopsy findings include excessive quantities of yellow stained peritoneal and pleuritic fluid; acute inflammation of the abomasum and entire intestinal tract; an excessive amount of hemorrhage; studded, edematous renal fat; marked nephritis with cortical hemorrhages; variable hepatic cirrhosis; scattered petechiae on the heart but no edema of the lungs.

The quantity of acorns found in the rumen is variable and seems to bear no close relationship to severity of symptoms.

Antibody Milk

Further studies on the mechanism of antibody formation in the bovine udder are reported from Hunterdon Medical Center, Flemmington, N. J. in *J. Lab. & Clin. Med.*, 55:229-244, 1960. A consistently higher level of antibodies in blood than in milk suggests that antibodies spill over from the blood into the milk rather than form in the udder and flow back into the bloodstream. High levels of antitoxin in the colostrum seem unrelated to the existing blood titer and may result from storage and concentration in the udder for some time before parturition.

Diphtheria antitoxin concentrations are the same in blood from a vein draining the udder and from the jugular vein. Therefore, while the main site of early antibody formation may be the lymph nodes draining the injected quarters, the rest of the reticuloendothelial system probably becomes the main source of antibodies if large doses of antigen are used.

Blood titers of human beings with low diphtheria antitoxin titers do not increase detectably when large doses of equine diphtheria antitoxin are ingested with skimmed milk. Insufficient absorption of antitoxin seems the most likely explanation.

Livestock Mathematics

A 36 ft. stock car will handle 50 head of 400 lb. feeder calves, 36 head of 600 lb., or 30 head of 800 lb. cattle. For a 40 ft. car, increase these figures ten percent.

Minimum pen size for individual young dairy calves is 24 square feet. The minimum pen size for calves in groups with no outside run is 30 square feet per calf.

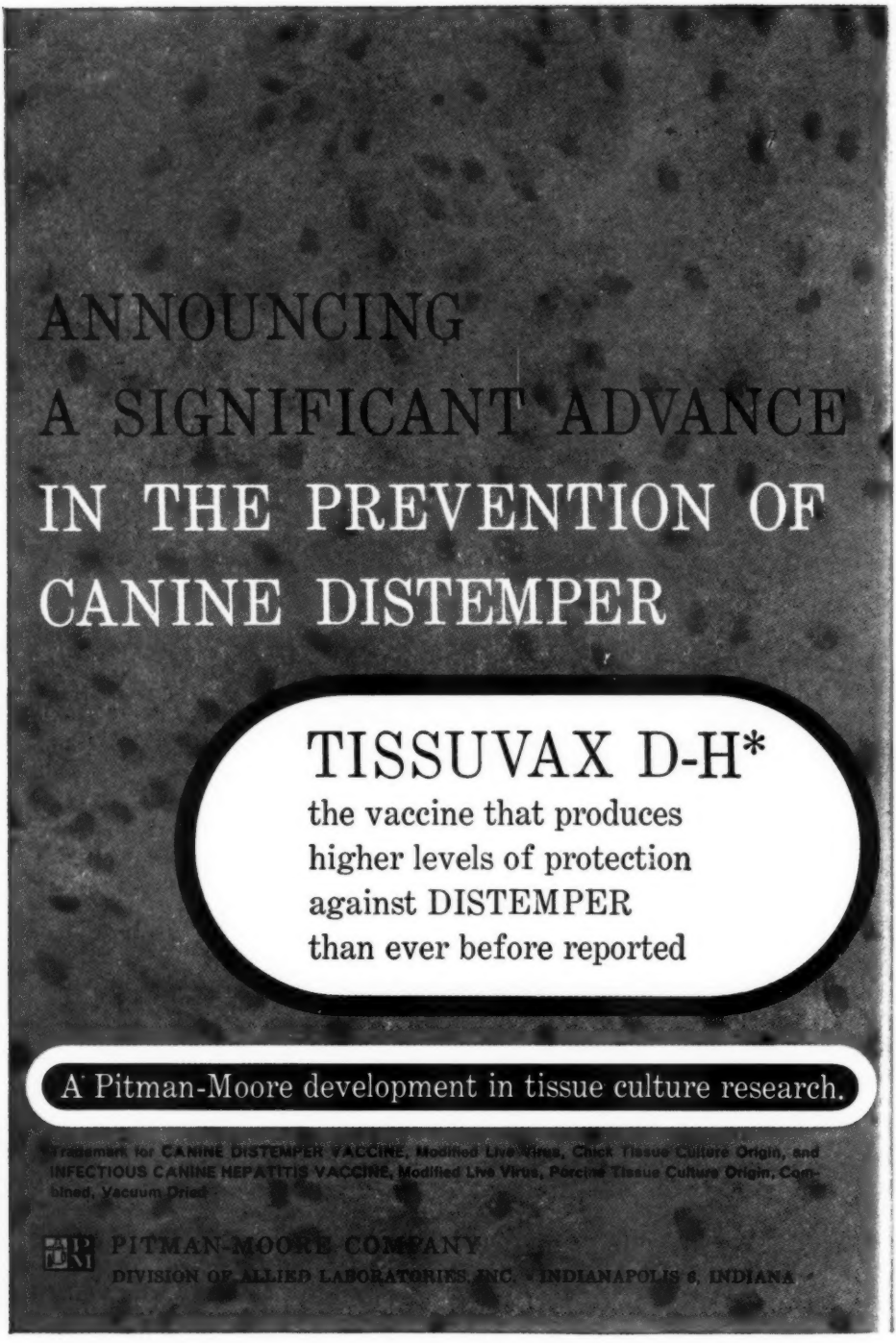
Tops of drinking cups and ration boxes for your dairy calves should be 20 inches from the floor.

Production for the average farm flock should exceed 200 eggs per year for each pullet housed.

A cow can't eat enough number three timothy hay to supply daily vitamin A requirements. She can get an optimum vitamin A intake from five to 11 pounds of number one hay.

It costs an average of $5.15 to breed a cow by artificial insemination. On farms where bulls are kept, the average cost will exceed $11 per head. Where both methods are practiced this cost may jump to $12 to $14.

SMALL ANIMAL PRACTICE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Rarefying Osteodystrophy In the Kitten

A. BARTON, B.S., B.A., D.V.M.
Forest Hills, New York

Rarefying osteodystrophy in the kitten is a bone disease characterized clinically by bone deformities due to a generalized softening of the bones and anatomically by an osteoporotic rarefaction which develops into an osteofibrosis. The disease is often curable if it has not progressed too far and it seems to involve a reversible imbalance of the endocrine glands.

Rarefying osteodystrophy is identical to the disease described by numerous authors under various names: osteogenesis imperfecta,[2] osteodystrophy of the Siamese cat,[7] bone dystrophy of possible endocrine origin,[9] fibrous osteodystrophy of the cat,[4] osteofibrosis,[5] and locomotive ailments in kittens.[10,8] The affection is somewhat similar to hereditary bone fragility in children.[1]

Symptoms

Clinical and radiological symptoms are apparent even before appreciable bone deformity develops. Bone rarefaction takes place before the appearance of locomotive difficulties and leg deformities. The osteomalacia is observable during the first few weeks of life, becomes more conspicuous as the animal gets older and is clearly apparent between three and six months of age. Clinical symptoms become clearly evident when the cat is of sufficient size and weight so that its movements are obviously deterred by bone deformities.

The cat maintains its appetite, is robust and has a thick bushy coat, but the appearance of its entire body seems globular, shorter and more compressed than normal. Its head seems coarser; its facial features are devoid of sharpness and delicacy; its shortened and somewhat thinner than normal neck makes the head appear as if it had been pushed into the shoulders. The thorax seems to lose its fullness and its reduced volume appears exaggerated because of the prominence of the abdomen. The abdomen is distended, heavy, abnormally developed, pendulous and flaccid. It gives the impression of a thick contraction of the body because its base is abnormally short; it is flattened laterally and curiously tapers to

*Translated, edited and rewritten from Brion, A., Fontaine, M. and Labie, C., Ostéodystrophie rarefiante du jeune Chat, *Recueil de Médecine Vétérinaire*, 136:5, 1960.

Note the contracted appearance of the body and the deformity of the vertebral column.

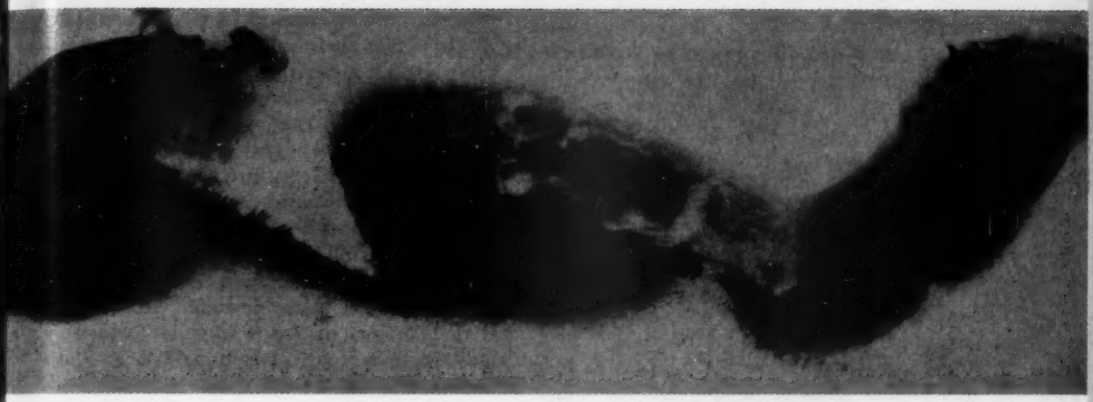
a point towards the rear. The line of the back has a characteristic slope because of one lordosis in the middle of the thoracic portion of the vertebral column and another in the lumbar region. On the other hand, a pronounced kyphosis causes marked projection of the posterior dorsal vertebrae. The anterior portion of the sternum often presents a bulging deformity.[4]

The cat looks still more deformed because of the way it stands on its legs. From a front view, the forelimbs are observed to curve inward, thus exaggerating the spread of the elbows.

The articulations of the legs are not modified and retain their suppleness. Palpation does not reveal any joint hypertrophy or articular pain. Pressure and torsion on the axes of long bones reveal lack of resistance at the diaphyses. In advanced cases, the clinician can press into the cortex of long bones without great effort and not evince violent pain. On the other hand, the manipulation of the vertebral axis indicates a certain rigidity and forced extension or flexion provokes moans and defensive movements. There is also some difficulty in extending the hind legs on a line with the lumbar vertebral column, and the angle of the hock cannot be totally straightened.

Pet owners are often more concerned

Paraplegia in the same cat as the result of a minor injury.



Radiograph of the skeleton showing different degrees of bone rarefaction in various parts of the body.

about various functional difficulties than of the bone disease itself.

Locomotive difficulties develop very slowly and often manifest themselves when the cat finds it awkward to perform the essential agile movements required for jumping. In the more serious cases, the cat changes its position with difficulty and takes short steps in a hunchbacked manner. The hind legs lose their speed and agility and the hind quarters seem weak and a source of annoyance.

This slow development is often interrupted by the sudden appearance of a total incapacity of one leg to function or of a paraplegia. A slight trauma or minor accident can result in a green stick, diaphyseal, comminuted fracture, which is often incomplete and gives relatively little pain. Fractures of the ribs, pelvis, and more rarely of the vertebrae may also take place. When painful posterior paralysis occurs suddenly, it is generally the result of a medullary compression caused by crushing or displacement of lumbar vertebrae. It can also take place more slowly with symptoms of a gradual compression of the spinal cord that may be due to structural changes of the vertebral spines with subluxation and dislocation of the vertebrae and by deformities in the bony pathways that conduct nerve impulses.

Constipation is another very characteristic functional disorder. The narrow pelvis causes difficulty in rectal passage, and the excreta accumulates in the posterior portions of the intestines as enormous fecoliths or masses of stool, which further accentuate the increased abdominal volume.

Lastly, there may be the eventual appearance of such complications as dyspnea as a consequence of difficulty in diaphragmatic movements, cystitis and urinary incontinence as a result of difficult urinary tract evacuation and coryza manifestations because of the narrowness of the nasal passages.

To be sure, these symptoms are those of advanced cases that are often irreversible and terminate in death because of serious complications. Careful examination is required in mild cases, for the only symptoms of bone dystrophy that may be present are that the forelegs curve slightly inward, the double bend in the vertebral column is subtly outlined, the body and stomach are respectively more compact and larger than normal. The disease is reversible in these cases. As the cat grows, the muscles become more powerful and the deformities become less apparent by the time the cat is one year old, at which time the bones become perfectly solid. Moreover, even in serious cases, the animals can survive and the bones

can become hardened, but the deformities remain because of the delayed calcification.

In the osteodystrophic malacia stage, the degree of bone rarefaction can always be determined by radiographic examination. The plates show a lack of calcification of the entire skeleton. The bones of the face are hard to identify; the vertebral column shows its abnormal curvature; the vertebral bodies show up very clearly; there are often displacements of sacral portions of the vertebral column; the ribs are only slightly visible; the sternum sometimes appears to have an abnormal curvature deformity. The leg bones lack opacity to the *x*-rays. Their epiphyses have poorly defined contours, and their bony stroma show large spaces in the bone marrow. Bony rarefaction of the diaphyses of long bones is evident in that the cortical zones are often reduced to thin compact lines while the medullary cavities appear disproportionately enlarged. The bones of the carpus and tarsus are too clear, especially in their central region, and the pelvic stroma lacks precision and definition. When diaphyseal fractures occur, the bones are flattened, crushed or bent, but the break in continuity is often not clearly visible on the plate, and its appearance is very much like that of a folded and crushed tube of plant material.

Radiology of advanced serious cases shows the increase in thickness without increase in density of flat bones, which sometimes appear hollowed out or filled with small hollow nodules. The epiphyses of the long bones are insufficiently calcified, and their trabeculation is poorly oriented. The metaphyseal zone is hypertrophied and slightly bent. The diaphysis has a cortical region thicker than anteriorly but its density is insufficient and unequal. The medullary cavity is always too clear and too extensive.

Pathological Anatomy

Distinctive visceral lesions are not found on autopsy, but a chronic gastroenteritis that is sometimes hypertrophic is frequently observed. The most important lesions are evident in the bones, but it must also be noted that the muscular system is underdeveloped. Examination of the skeletons of cats born of the same parents, raised together or separately, and that had attained the same degree of development at three months of age but sacrificed at different ages, revealed macroscopic lesions that corresponded exactly to those noted by Labie, Bourdin and Guillon[3] in the early stages of the disease, and to those described in detail by Groulade, Thiery and Drieux[4] when the bony affection was very advanced in time and intensity. In both cases, the flexibility, lack of bone continuity, the thickening of the flat and short bones, the hypertrophy of the vertebral bodies, and the fragility of the diaphyses of the long bones with their very thin cortices are noteworthy. In the oldest lesions, the difference lies in the greater thickness of the metaphyses and the periosteum. However, when observations in the mildest cases are held off long enough, the bone rarefaction has disappeared and only the deformities remain.

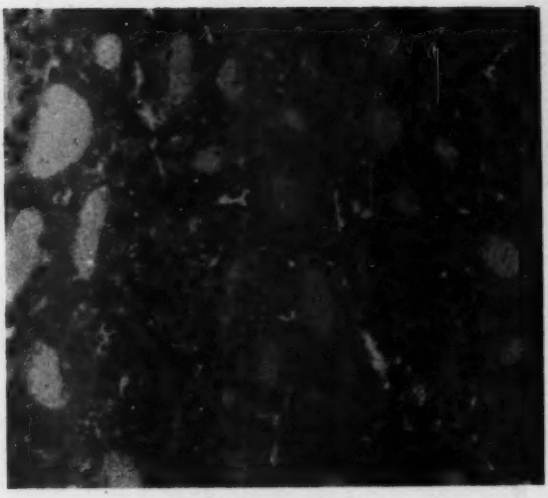
Histological study of the bones at different stages of the disease lead one to believe that the dystrophic process starts as a pure osteoporosis and develops into an osteofibrosis. It is not necessary to repeat the complete descriptions already published on the early lesions[3] or on the advanced lesions[4] of fibrous dystrophy.

We will simply note the most significant facts relative to the development of the disease, i. e., when the cat is from six to eight months of age. In flat bones, as the frontal bone for example, the thin bony trabeculae are surrounded by continuous rows of osteoblasts; the marrow is fibrous, made up of young connective tissue; the long bones are very rarefied and thin and show hollowed out and resorbed areas in which there may be some osteoblasts, though their presence is quite rare; the Haversian canals are considerably dilated.

The bone marrow has undergone a fibrous metaplasia, and here and there areas of osteofibrosis occupy broad spaces or are widespread in numerous small foci. In the

midst of the osteofibrotic areas, there are bony trabeculae with numerous osteoblasts. The region of fused cartilage is normal except in the area where it has been deterred in its development and is eroded. The cartilage has a tendency to proliferate in various directions, parallel or concentric, in relation to the axis of the bone, and the cartilaginous areas extend far into the diaphysis.

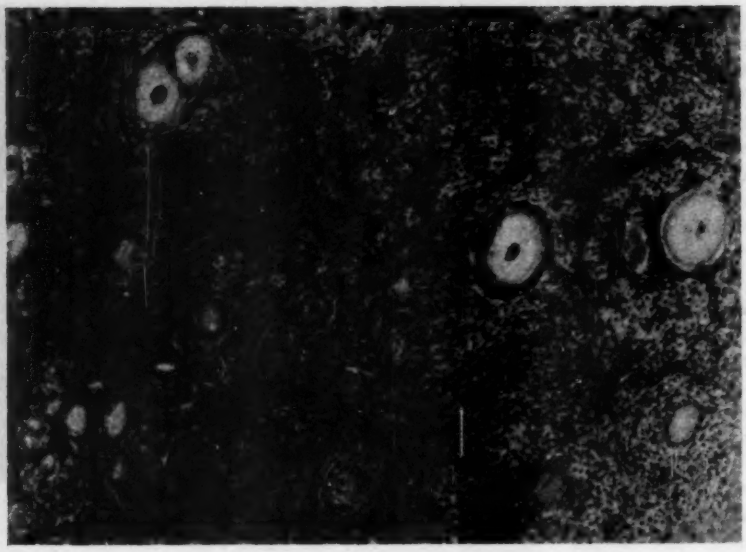
From the foregoing histological study, it seems that the development of the bone lesion can be retraced. "The retarded osteogenesis is insufficient to compensate for the intense lytic activity of the osteoclasts. Modifications in secondary ossification are thus thrown out of equilibrium in favor of bone resorption. Moreover, the presence of cartilaginous elements in the diaphyseal marrow lead one to suppose that the bone dystrophy began in the fetal life of the



Thyroid showing congestion of stroma, vesicles and cylindrical epithelium, and colloid which is rarely present (Zeiss. obj., 8, Oc. 16).

TABLE 1

	3 months	5-7 months	8 months
Anterior Pituitary	Increase in number of eosinophiles.	Enormous predominance of acidophiles.	Rich in active acidophiles.
Thyroid	Hyperactivity.	Generalized hyperactivity.	Hyperactivity. Cylindrical type epithelium, colloid rare, congestion of stroma.
Parathyroid	Normal.	Hypertrophied; clear cells with cytoplasm finely vacuolated, nucleus normal but often nucleolated.	Hypertrophied and hyperactive; acidophile cells finely granular.
Adrenal cortex	Glomerular zone normal; hypersponginess of zona fascculata.	Hypertrophied; cortex calcifying; hypertrophy and hyperplasia of glomerulus with clear cells; disorientation of fasciculata with adenomatous foci of cells deficient in lipids.	Calcifying cortex; glomerular hyperplasia.
Testicle	Beginnings of adult normal testicle.	Testicle inactive, at stage of primary sexual cord or with tube degeneration; interstitial gland well developed or atrophied.	Tubes normal, interstitial glands atrophied.
Ovary	Structures associated with fetal and puberal ovary.	———	Mature follicles; atretic follicles; interstitial gland abundant.
Thymus	Normally developed.	Sclerosis of stroma; rarefaction of thymocytes in centrolobular zone; reduction of thickness of peripheral zone; Hassal corpuscles rare.	———



Cortical zone of ovary showing numerous ovocytes and abundant interstitial gland (Zeiss. Obj. 8, Oc. 6,3).

animal.'"[9] Furthermore, "the disappearance of numerous bony trabeculae where the fibrosis began has been established. The bony lesion thus seems to be the result of the fusion of the bony trabeculae mainly by osteolysis as is shown in the progressive disappearance of calcium salts and later of the ossein located on the border of these bony trabeculae. When the osteoblasts are free of ossein, they seem to take over the function of ordinary connective tissue cells and elaborate increasing amounts of collagenous fibers. The fibrosis of the marrow seems to be only a consequence of the resorption of the mineral salts."[4]

The endocrine glands have unique histological characteristics. Most authors have noted thyroid hyperactivity but Scott, Scott and Greaves[11] have observed that thyroidal adenopathy seems to be normal in cats. We had a case in which the vesicles of the thyroidal basal cuboidal epithelium were filled with colloid with no evidence of resorption, thus indicating that the gland seemed to be inactive, while in other cases we have found evidence of hyperactivity.

Comparative data of sections taken from three-month-old cats with osteoporosis, five to seven-month-old cats with osteoporosis and early osteofibrosis and those of eight-month-old cats with very advanced osteofibrosis are summarized in the following table.

We have also investigated a single case of the lesions of the cervical and iliac lymph nodes and of the kidneys of an animal six months old in the early osteofibrosis stage. The nodes were hypertrophied and swollen and had a congested appearance on section; a reticulosis made the entire organs more dense; the clear germinal centers showed a predominance of reticular cells while lymphoid cells were only rarely present. There were angular-shaped acidophile intranuclear inclusions in the reticular cells of both nodes. The kidney was congested; some of the glomeruli were hyalinized; the kidney cells showed a granular degeneration; the cilia had disappeared and in the intermediary portion as well as in the convoluted tubules, the cellular cytoplasm had undergone a vacuolization that was different in appearance from that of the normal fatty overflow of the cat's kidney.

Can these histological studies tell us anything about the pathogenesis of the disease? These studies generally bring out that there is hyperactivity of the pituitary and adrenal glands; the adrenals undergo structural changes at an early stage; a

thyroid hyperactivity is often present and there is always a parathyroid hyperactivity in advanced cases. We are led to believe that the bone disease is due to an adrenopituitary imbalance and that the osteofibrosis which later takes place is the result of a secondary hyperfunction of the parathyroid. Also, the fibrous bone lesions seem to occur mainly in males. Thymus and gonad modifications are related to the seriousness of the disease. We ignore the importance of ganglion lesions and in particular those of the intranuclear inclusions of the reticular cells. In conclusion, it is our opinion that this bone disease starts out at a very young age as an osteoporosis due to an excess of osteolytic over osteogenic activity. The disease is related to a pituitary-adrenal imbalance until the hyperparathyroidism takes over and advances the bone pathology to an osteofibrosis. The most severe cases terminate in a very serious fibrous dystrophy, and the mildest cases are spontaneously cured.

Etiology

The etiology of rarefying osteodystrophy of kittens is unknown.

Observation shows that the frequency of the disease has significant variations from year to year and may occur in limited geographical areas. Among other things, this may imply, as so many breeders believe, that the disease has an hereditary character. Coop[5] is of the opinion that the disease may be caused by a simple recessive hereditary factor, but other authors, mainly Henderson and Keywood,[6] disagree since they have not succeeded in uncovering any evidence for this influence.

Those who have studied the disease have indicated that it mainly affects the Siamese. However, in our 20 cases, we have found no evidence of this specific racial character. We have found the disease in Siamese, Persians, European breeds and mixed breeds. On the other hand, other observations *do* indicate that the disease may have an hereditary character. We have found, as has Lebeau,[10] that there may be repeated attacks in animals coming from the same mother. Furthermore, in a family of Persians, we found the disease in varying degrees in all the cats in three successive generations when the dams were sired by the same male. An hereditary predisposition would thus sometimes seem to be present in the establishment of osteodystrophy. Henderson and Keywood[6] believe that this is due rather to a nonhereditary factor that intervenes during the fetal period. Fagg[12] suggests that the congenital deficiency is later aggravated by a dietary imbalance in the mother during the two months preceding whelping.

The diet of the kitten undoubtedly contributes to the development of the lesions. We agree that this cause can aggravate a prenatal predisposition and, with Henderson and Keywood[6] and Humphreys,[7] we can incriminate the genesis of certain cases to a diet made up exclusively of raw meat and water fed to the cats since weaning time. This causes a calcium-phosphorus imbalance for which the feeding of milk is of value. From case history data, we have not been able to incriminate any other specific diet as an evident cause. Lastly, Bequignon had a case that he claimed was due to a toxoplasmosis.

Treatment

What can we learn about the disease from the various therapeutic efforts? It must be understood that in order to critically evaluate the efficacy of a medication, we have to take into account the fact that animals which are only slightly or moderately affected may be spontaneously cured a short time after the appearance of the clinical symptoms. In addition, Coop[5] has shown that restriction of movement of the affected animal in a small cage hastens the cure. This leads one to conclude, paradoxically, that repair takes place quite easily in those cats that have undergone a trauma that forces them to remain immobile or to restrict their movements.

Henderson and Keywood[6] have fair success in treating these cases by adding milk to the diet and administering vitamins A, D, B_{12} aid B_1. James[8] tries to correct the dietary deficiencies and prescribes the use

of parathyroid extracts.

Lebeau[10] obtained a series of rapid cures with a mixture of oily solutions of vitamins A and D and terramycin, while his earlier attempts with only vitamins A and D and calcium did not result in sufficient improvement. These therapeutic facts merit reflection because they immediately suggest the existence of an infectious cause, while the equally beneficial results obtained by Coop[9] lead one to believe that it is really a hormonal dysfunction. In fact, Coop cured 26 out of 28 cases by putting them in cages and administering ½ mg./kg. of diethylstilbestrol intramuscularly every three weeks to females, and 1 mg./kg. of testosterone every three weeks to the males and also gave 2 mg./kg. deltacortisone to both. We have had very good results in hormone therapy by administering a single injection of 25-50 mg. testosterone heptylate to males and a subcutaneous implant of 12 mg. hexestrol to females. In one case, we had obvious improvement with a daily dose of 1 mg. deltacortisone. Lastly, observations on two cases have convinced us of the excellent action of a synthetic pituitary preparation, paraoxypropriophenone (Frenatol) in a dose of ½ of a 25 gr. compressed tablet per day. The results are difficult to interpret since the drug reduces the production of gonadotrophins and thyrotrophin.

Conclusion

We have tried to describe in some clinical and histological detail a bone dystrophy of kittens which begins as an osteoporosis and develops into an osteofibrosis. Histological evidence tends to incriminate disorders associated with the endocrine glands as hyperfunction of the pituitary and adrenal and later of the parathyroid glands.

Various therapeutic efforts of numerous clinicians have been more or less successful. We have obtained some interesting results with sexual hormone therapy and with synthetic pituitary preparations.

The origin of the disease seems to be partially related to a congenital factor that may be hereditary. It may be aggravated by faulty diet.

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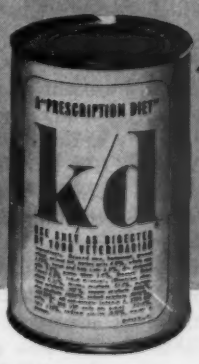

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Part III

Surgical Procedures for the Routine Small Animal Practice

(continued from the August 1960 issue of VM)

ROBERT L. LEIGHTON, VMD
Head of Department of Surgery
Animal Medical Center
New York, N. Y.

The dog in particular is remarkable for the amount and variety of foreign objects he ingests. A great many pass through unnoticed but those that cause trouble are lethal and worrisome. If the foreign body can be palpated distinctly, the indicated surgery is done immediately. Sometimes anesthesia or tranquilizers are helpful aids to palpation. If one makes it a habit to palpate the abdomen of most every patient presented for examination, it trains the fingers in detecting abnormalities. Differentiation from tumors, inside and outside the bowel, and intussusception, retained testicle and incarcerated hernia can be done.

The *x*-ray is tremendously helpful, the more so in those cases where other physical evidence is lacking or not distinct enough to lead to a firm diagnosis. We usually take a flat finding plate, and give barium, taking one picture with the opaque media in the stomach, one to check emptying time of the stomach, and one to see that the material traverses the intestinal tract. Laboratory-wise we usually see an elevation of white count and some rise in B.U.N.

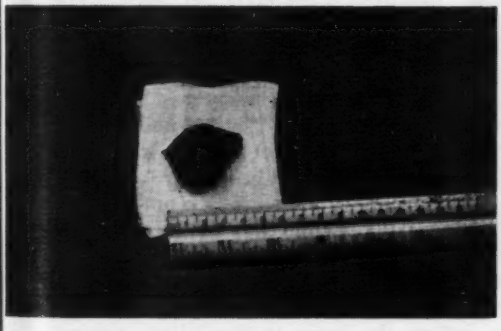
Some objects pass through such as needles, while others, like stones, bells, buckles, buttons, whistles, balls, fragments of rubber bones, bottle tops, Christmas tinsel and other items, are readily identifiable. But what, you may ask, about the non-radio-opaque things, like baby nipples, cloth, stockings, corn cobs, pieces of wood, plastic toys, peach pits, strings, etc.? Many are not even readily palpated, certainly not distinctly. The veterinarian must not wait too long, for surgery should be done with the patient as strong as possible. The surgeon always has in mind, "Just what condition is that bowel in?" Early surgical interference with a simple enterotomy is one thing, but removal of necrotic bowel and end-to-end anastomosis is another. I fear that I tend to err towards the side of surgical intervention in doubtful cases, even at the risk of finding nothing.

Case History

The following history is taken from a recent case of intestinal foreign body. A young mongrel Boxer female was first noticed by the owner to be ill on December 15, 1959, with anorexia, vomiting and no stools. This continued for three days, when the dog was presented in the clinic. It was booked in as suspicious of intestinal obstruction and possible foreign body. A suspicion of a possible mass near the posterior kidney level was felt, but no one could be sure. She was given 500 S and D, 250 mg. of Biosol *B.I.B.*, and 1 cc. of Aqua B, *I.M.* The

following day she was bright, alert, and much improved but food was refused, and no stools were seen. A G.I. series was taken. The flat plate at the time appeared non-contributory. The barium left the stomach readily but showed the upper small intestine to be dilated, with a sudden change to a normal even spastic diameter. A later plate showed the barium had failed to move on satisfactorily. Surgery was done the following day since we now had to convince the owner.

A mid-line incision was made and routine examination of the viscera was done. A mass was found obstructing the lumen of the jejunum but the bowel was in fair condition around it. The object was moved posteriorly to an area of normal bowel and a longitudinal incision was made. A peach pit was removed. Closure was made with No. 000 chromic catgut in an inverting suture. Some omentum was tacked around the surgical site.



Peach pit removed from intestine of Boxer.

A routine abdominal closure was made. I usually add some Biosol solution to the physiological saline in which I soak sponges to place around the affected area.

This dog though weighing 40 pounds took only 5 cc. of Somnopentyl (Pitman-Moore) for anesthesia. Her condition was listed as fair, and recovery from the surgery took place.

Geriatrics

One of the results of increased medical care of animals has been an increase in longevity. Veterinarians must keep upping the age limits of surgery. It simply isn't defensible to refuse surgery because of age alone. We have done considerable work on 12 and 14-year-old dogs, have operated satisfactorily on a goodly number of 16-year-olds and have done dental work using Surital (Parke-Davis) on dogs and cats up to 21 years of age. Surgical procedures in aged animals have consisted of tumors, usually mammary, pyometra-metritis, and dentistry.

I should like to discuss pyometra-metritis surgery as representative of major surgery done on aged, toxic, and at times extremely debilitated subjects. In an urban area such as New York, where a large number of female dogs and cats are kept that are not bred and not spayed, the condition of pyometra-metritis is exceptionally common. We average about one every working day. I have done as many as five in one day. These animals are not usually presented until they are ready to or already have collapsed. They are old, weak, and toxic.

Our procedure has been to use minimal anesthesia, provide oxygen by tracheal tube during surgery and to begin blood transfusion through the same needle with which the anesthesia was administered. Pentobarbital sodium only to effect was used. No pre-anesthetic medications were given. A form of intravenous Meticortelone (Schering) was given to every other case over a considerable period of time and seemed to be clinically useful. Speed in surgery, plus care and good hemostasis, require the full attention of even the most skilled operator. The shorter time these animals are stressed the better. The mid-line incision is carried to or through the umbilicus to facilitate removal of the ovaries. Frequently, masses of fat and a generally friable and hemorrhagic condition of the tissues are present, which prevent much traction on the ovarian ligament with safety.

Examples of pyometra-metritis surgery. Top, canine. Bottom, feline.

The stump blood vessels are ligated separately and double ligatures are placed on the body of the uterus itself. Removal is as close to the cervix as possible. Where needed, an inverting suture is placed over the end of the stump. A silver nitrate stick is applied to the cut end of the stump, and the scalpel used to make the cut is discarded. Where a beginning peritonitis seems present, I have placed saline solution spiked with Biosol in the abdominal cavity before closure. These animals survived, but I'll be the first to admit this isn't a very scientific approach.

The response to whole blood is dramatic and life saving. Some old patients may require several transfusions, but they are helped enough to make the grade in most cases.

The combination of care in anesthesia and surgical handling, oxygen, and blood make it possible for those patients formerly considered inoperable because of age and debility to be successfully returned to a happier and more useful existence.

Thoracic Surgery

Thoracic surgery can vary from simple invasion of the chest cavity as in fenestration of thoracic vertebrae or repair of wounds, to more extensive procedures; from repair of diaphragmatic hernia to lung tumor removal, repair of patent ductus arteriosus, esophageal surgery, removal of heart worms, etc. Likewise, equipment for such work can vary in elaborateness and expense. We have used the National Cylinder Gas Co. machine with success in dogs, but for cats and tiny dogs our best success has been with a simple glass "T" tube and a good technician. Adaptation to the rate and depth necessary is easily made. A rhythm of count such as closed, 1-2-3; open, 4-5-6-7-8, is usually good. When the chest is open the lungs can be decreased in inflation for inspection or a difficult to place stitch and then started again. The technician is told to inflate the lungs to the fullest, getting the count necessary to achieve this. When final closure is made, this count is used to inflate the lungs to the fullest just prior to final chest closure. Re-establishment of voluntary respiration is done by letting a certain degree of CO_2 tension build up and then adjusting to the respiratory attempts of the animal. We have not found a machine that is as adaptable and effective. I would not feel that a chest approach to a diaphragmatic hernia, for example, is interdicted for the average practitioner because of expense.

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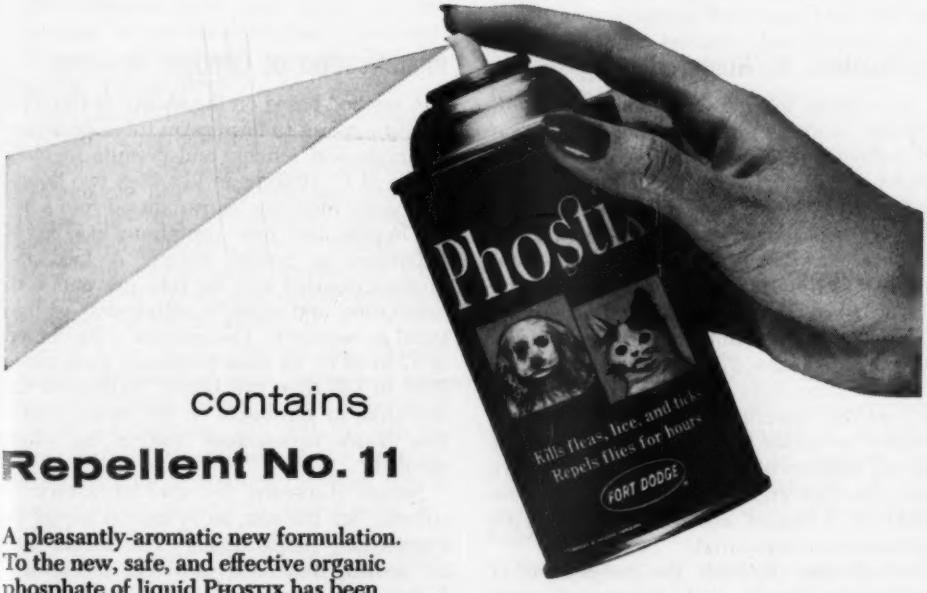

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Small Animal Clinic

Stimulation of Wound Healing

In rabbits, the rate of fibroblastic proliferation, capillary formation, and maturation of collagenous fibrils is accelerated by implanting tissue extracts in closed wounds.

Ivalon sponges were filled with equal parts of heparinized autologous plasma and a tissue extract, autologous spleen, or autologous sterile posttraumatic granulation tissue with Tyrode's solution. Tyrode's solution was substituted for tissue extract in control sponges.

When firm clots formed in the sponges, control and experimental sponges were embedded on either side of wounds in erector spinae muscles of rabbits. Two to 21 days later, sponges and surrounding tissues were fixed in formalin and serial microscopic sections were compared.

At all time intervals, the components of granulation tissue had penetrated more deeply into pores of sponges containing tissue extract. Fibroblasts were more numerous, and collagenous fibrils were more mature in experimental sponges. Only chick embryo extract produced infiltration of inflammatory cells.

Arch. Path. 69:286-302, 1960.

Identification of Candida Albicans

A method based on the ability of Candida albicans spores to form germ tubes on serum is simple and reliable and permits identification of C. albicans in less than two hours.

A small inoculum is introduced into a 10- by 75-mm. test tube containing 0.5 cc. of individual or pooled serum. A medicine dropper inserted into the tube prevents contamination and permits withdrawal of material as required. The mixture is incubated at 37 to 42 C. In most instances, germ tubes form in less than two hours. Failure of the inoculum to germinate on the serum within five hours necessitates testing by other methods.

Serum discarded by the laboratory is suitable for the test, as is animal serum or commercial preparations. The serum can be pooled, dispensed into test tubes, and frozen until needed.

J. Dis. Child. 99:212215, 1960.

Susceptibility to Infection

Resistance or susceptibility to microbial disease that is assumed to be inherent may be determined instead by the microbial flora

of the intestinal tract. Investigation at the Rockefeller Institute compared specific pathogen-free mice with animals from the parent colony raised under ordinary conditions. The pathogen-free mice gained weight more rapidly on nutritionally complete rations, continued to gain on deficient rations, were more susceptible to experimental bacterial infection, and were more resistant to the lethal effects of endotoxins. The intestinal flora of the 2 groups was strikingly different. After contamination of the pathogen-free mice with a strain of Escherichia coli from the ordinary mice, differences between the groups in weight gain and susceptibility were eliminated.

J. Exper. Med. 11:407-417, 1960.

Aortic Grafts

Polyurethane foam has many of the properties of an ideal arterial transplant, and aortic grafts made from the material function well in dogs.

Observations in 16 dogs three weeks to six months after insertion of grafts indicate that polyurethane foam (1) is chemically inert and not physically modified and (2) gains strength and is bound into position by ingrowth of fibrous tissue. Grafts are simply and inexpensively made, are easy to handle and suture, and can be sterilized by boiling for ten minutes.

Of 16 foam grafts with spongy internal surfaces, 13 remained open. In each of nine dogs with grafts made of the membrane form of polyurethane VC, with smooth internal surfaces, thrombosis of the graft occurred, tending to confirm the view that a smooth inner surface is undesirable for arterial transplants.

J. Appl. Physiol. 15:18-22, 1960.

Sterilization of Instruments

Beta-propiolactone (BPL) is 25 to 4,000 times more active than are formaldehyde and ethylene oxide when used to sterilize instruments and other objects at room temperature. BPL has a broad field of application but should be stored and handled with an understanding of the material's limitations and toxic properties. The substance is used in three forms: vaporized in air at atmospheric pressure by heat, vaporized at room temperature under reduced pressure, and applied as an aerosol by nebulizers.

J.A.M.A. 172:1759-1763, 1960.

Cerebral Anoxia

Dogs can withistand total arrest of the cerebral circulation for up to ten minutes without apparent neurologic damage.

Aortic and vena caval occlusion for ten minutes produces temporary ataxia in some animals. After twelve minutes of anoxia, permanent cerebral damage may occur. Death ensues within four days after induction of cerebral ischemia for thirteen minutes and within twenty-four hours after fourteen minutes of occlusion.

Reported lesser tolerance to cerebral anoxia probably is due to associated production of myocardial anoxia, resulting in inadequate blood pressure when cerebral flow is reinstated.

Bull. Johns Hopkins Hosp. 106:74-80, 1960.

Nonspecific Immunity

The mechanism by which immunity can be induced in mice by injecting bacterial lipopolysaccharides seems to comprise an increase in the opsonic capacity of the serum and direct stimulation of phagocytic cells.

Pretreatment of injected bacteria with sera from mice given lipopolysaccharides 48 hours previously was more effective in stimulating phagocytosis than was pretreatment with normal serum. Number of organisms recovered rapidly diminished, and amount of phagocytosis was much greater than with normal serum.

J. Exper. Med. 3:137-144, 1960.

Oleandomycin in the Treatment of Canine Pyogenic Dermatitis

FRANK KRAL, V.M.D., V.D.M. (h.c.)
Professor of Veterinary Medicine
University of Pennsylvania
School of Veterinary Medicine
Philadelphia 4, Pa.

Pyogenic dermatitis in the dog always has been refractory to treatment. Several investigators have reported good results with antibiotics such as penicillin, streptomycin, terramycin, novobiocin, chloromycetin and aureomycin and, in the past, the author has used alcoholic solutions of dyes, bacitracin, tyrothricin and disinfectant lotions and ointments.[1] However, the need for more effective, specific therapy remains, thus a new chemotherapeutic agent used for the systemic treatment of human staphylococcal infections was used.

Oleandomycin is an antibiotic substance produced by a strain of Streptomyces antibioticus and, until recently, it was available only in the form of its phosphate salt. This salt is satisfactory for parenteral use but oral doses fail to produce effective blood levels. However, by acetylation and the development of the crystalline ester, Cyclamycin® (Triacetyloleandomycin—Wyeth), oral tolerance was improved and significantly higher blood levels were obtained.[2]

One of the most significant problems associated with the treatment of staphylococcal infection is the development of resistance to the drug, for although the percentage of strains developing resistance may be low, they are an obvious threat. Flanigan, Leming and Lawrence[3] have reported that staphylococcal strains re-isolated from 65 human lesions demonstrated no significant increase in *in vitro* oleandomycin resistance.

Human clinical studies have shown the effectiveness of triacetyloleandomycin in pyogenic infections,[4] in acne and pyodermas,[5] in pediatric infection,[6] in venereal diseases,[7,8] and in miscellaneous wound infections, breast abscesses, furuncles, etc.[9] The highly favorable medical reports cited constitute the basis on which it was decided to use oleandomycin and triacetyloleandomycin in canine pyogenic dermatites, especially in those patients who had not responded to prior therapy.

Treatment

During the past 12 months, 24 canine patients were selected from our clinic admittees. These animals showed skin lesions characterized by inflammation of the skin, acne, furunculosis and, not uncommonly, by deep and undermined pyoderma. Organisms prevailing in bacteriological isolates were: Staphylococcus pyogenes aureus (coagulase positive), Staphylococcus epidermidis (coagulase negative), Streptococci of

hemolytic and non-hemolytic types and Proteus vulgaris.

Hospitalized dogs of medium size were given 250 mg. oleandomycin phosphate (5 mg./cc. in sterile, distilled water) by slow intravenous injection each day for six to eight days. Outpatients were given 250 mg. oral doses of triacetyloleandomycin twice daily for ten to 14 days. In instances where the patients were slow to respond either regimen was repeated after a 14-day interval.

In instances where extensive dermal undermining was evident, oleandomycin phosphate in 10% solution was used to infuse the fistulous tracts.

Of the 24 animals treated, 16 recovered within four to eight weeks. Six dogs required a second course of treatment because of recurrence of the lesions two months later. Two animals with extensive pyoderma of prolonged duration failed to respond to all form of treatment and were destroyed.

Conclusions

Canine pyogenic dermatites have been refractory to systemic and local treatment with antibiotics, perhaps because of insensitivity of the infecting organisms. Favorable response following the use of oleandomycin, in systemic or oral forms, shows the value of this antibiotic even after the failure of other treatments.

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Specific Gravity of Urine

The specific gravity of the urine is determined with a urinometer. Since small quantities of urine are often obtained, a cylinder with a capacity of 30 cc. is most suitable. Urinometers are calibrated to give accurate readings at certain temperatures, usually 20 or 22.5 C.

Corrections are made according to the temperature of the urine as follows: (1) add 0.001 for each 3 C. above the calibrated temperature and (2) subtract 0.001 for each 3 C. below the calibrated temperature. Failure to take into account the temperature factor leads to erroneous results, especially if the urine has been kept in the refrigerator. For accurate readings, do not permit the float to touch the side and bottom of the cylinder and avoid air bubbles. The latter can be removed with filter paper.—*Atlas Newsletter.*

Things Worth Knowing About Monkeys

E. J. FRICK, D.V.M.
Head, Department of Surgery and Medicine
Kansas State University

Veterinarians treat many kinds of animals, and ever so often a veterinarian is called upon to handle a monkey. Some of the following information may help you appreciate these primates and perhaps help them be appreciated more by their owners. A little knowledge of the monkey family is interesting and worthwhile and adds to your ability to care for them.

There are many, many kinds of monkeys, ranging from such descriptive names as lion tail, red howler, squirrel, wooley, owl and the two most commonplace, the rhesus and spider monkeys. In fact, there are at present about 74 genera, in which are included 213 species and 653 races. Roughly, monkeys may be divided into two groups, the New World or Platyrrhines and the Old World or Catarrhines. This is a handy grouping, as the New World monkeys have nostrils that are wide, with 36 teeth and usually a long prehensile tail, and can thus be distinguished from the Old World monkeys with narrow nostrils and 32 teeth similar to man. The Old World monkeys also have bare ischial callosities and well developed cheek pouches. This latter feature is probably due to the fact that Old World monkeys spent more time on the ground, where they developed large cheek pouches, while the tree-dwelling New World monkeys tended to develop long, grasping tails.

Perhaps the cutest are the little primates or marmosets — meaning dwarf. This little monkey mostly found in South America's equatorial forests includes some 32 species, and the Pigmy from the upper Amazon may weigh less than two ounces when grown. Another interesting observation is the marmosets have claws instead of nails on all fingers and toes except the great toe. They have only two molar teeth in each side of the upper and lower jaw instead of three like the other New World monkeys.

It is not advisable to mix monkeys as there is a very definite peck order and groups tend to gang up on newcomers, with sometimes fatal results. The best way we have found to introduce one monkey to another, or to a group, was to put it in a small cage inside the others' enclosure with a suitable rock on the door. Then when the others freed the new monkey against myself as a common enemy, it became an accepted member of the gang.

A good monkey diet is composed of vegetables, fruit, hard boiled eggs, a vitamin supplement, fresh shrimp, and a little raw or cooked hamburger. Monkeys commonly eat flies and other insects, while raw meat is often consumed ravenously and with gusto. It is a popular idea that monkeys are vegetarians, and as a result they often are in need of a higher protein diet, as they are omnivorous.

Every monkey we examine is carefully checked for parasites, and usually strongyloides and oesophagostomum can be found, along with round, whip and tapeworms. We have had pet monkeys brought to our clinic harboring four separate diseases transmissible to man. Tuberculosis is not as uncommon as ringworm. Rabies and B encephalitis virus, both nerve viruses, also can occur in monkeys. For these reasons and because of their unsanitary habits and the fact that they can jump and bite, one handling monkeys should use every precaution and be constantly alert when actually working with them.

Aside from the sentimental value, the commercial value of monkeys runs from $25 to $250 — this does not include the large apes. An average price for the laboratory Rhesus ranges close to $40. There is a vast store of knowledge about monkeys, their care and diseases, and much of this can be found in the conference papers on Care and Diseases of the Research Monkey, held in November, 1959, at the New York Academy of Sciences.

A Preliminary Report on Rapacodin

THOMAS E. VICE, D.V.M.
WALTER A. LAWRENCE, D.V.M.
San Antonio, Texas

About a year ago our attention was directed to a "new" narcotic-analgesic, Rapacodin (Knoll). Although it is a new drug to American veterinarians, we have learned that it has for some years been used by European physicians, but almost exclusively as an antitussive.

Included in *Research Reviews* (Medical Science 1:35, Mar. 10, 1957) was a section on *The Search for an Improved Potent Analgesic.* This brought out that: "Dihydrocodeine is not an analgesic of the morphine class. It is more like codeine of increased potency. Dihydrocodeine promises to be a useful analgesic at the 30 mg. dose for much of the pain currently being treated with more potent analgesics (e.g., morphine and dilaudid).

Another research review *Pain* (J. Amer. Med. Assoc., 165:427, Sept. 28, 1957) stated: "It (dihydrocodeine) has been given for the relief of moderate postoperative pain in a dose of 30 mg. per 70 kg. of body weight . . . With the 30 mg. dose, side effects are hardly greater than with a placebo . . . In the United States, dihydrocodeine was given in doses of 30 mg. to patients in normal labor. It did not cause cadiovascular or pulmonary depression in the mother or a decrease in the heart sounds of the fetus. There was less over-all fetal depression with 30 mg. of dihydrocodeine than with 100 mg. of Demerol (Winthrop). During the postpartum period, dihydrocodeine effectively relieved the discomfort of uterine contraction . . . "

Gravenstein *et. al.,* of the Anesthesia Laboratory, Harvard Medical School, reported their evaluation of Rapacodin in the *New England Journal of Medicine* 254:877, May 10, 1956. These investigators found that: "Dihydrocodeine produced greater analgesia than codeine. Dihydrocodeine, 30 mg., is not significantly less potent than morphine 10 mg., although there is a trend in favor of morphine . . . This finding is of particular interest in view of the remarkable 'absence' of side effects in the 30 mg. dose of dihydrocodeine."

Dogs with refractory, chronic or recurrent infection of the anal sacs were selected as experimental subjects, as many of these animals are not particularly attractive surgical risks. When evaluating these patients one must frequently weigh surgery and its risk of mortality against not operating and condemning the animal to a future of constant discomfort and the risk of development of anal fistula.

Theoretically, induction of local anesthesia, packing the anal glands and extirpating them are relatively simple procedures, easily and quickly accomplished. But these cases can be quite troublesome, because the patient fights restraint before the operation, while local anesthesia is being induced, and during the packing and surgery.

Something is needed to render these animals more tractable. Preoperative morphine and/or Demerol have not fully met this requirement. They carry with them the potential hazard of morphine or Demerol-induced depression of the respiration and circulation. Also, morphine tends to cause unwanted vomiting and both Demerol and morphine increased intestinal peristalsis during the operation. Preoperative barbiturate medication does not provide true analgesia and presents a tendency to keep the animal dormant for too long after the operation. We favor early postsurgical ambulation, both for the physiologic benefit to the patient and for the desirable psychic effect on the client.

Our experience to date with Rapacodin as preoperative medication has established

TABLE 1

RAPACODIN ACUTE TOXICITY DATA*

***All Animals Used as Experimental Subjects Were in a Normal State of Health**

Experimental Animal	Weight (Lbs.)	Normal Heart Rate	Normal Respiratory Rate	Intramuscular Dose of Rapacodin Administered	½ Hour Later Heart Rate	½ Hour Later Resp. Rate	1 Hour Later Heart Rate	1 Hour Later Resp. Rate	2 Hours Later Heart Rate	2 Hours Later Resp. Rate	Untoward Effects
Dog #1 (Bassett)	38	94	26	2 mg./lb.	82	51	88	53	82	57	none
				2.5 mg./lb.	80	51	81	51	81	52	none
				3 mg./lb.	74	33	78	37	76	37	none
Dog #2 (Mixed Terrier)	15	105	19	1.3 mg./lb.	87	21	87	22	86	20	none
				2 mg./lb.	84	21	83	21	84	22	none
				3 mg./lb.	81	22	76	24	85	25	defected
Dog #3 (Beagle)	24	93	26	1.5 mg./lb.	89	28	86	37	87	31	none
				2 mg./lb.	86	24	83	27	86	23	none
				3 mg./lb.	81	31	82	30	85	26	none
Dog #4 (Chihuahua)	8	92	22	2 mg./lb.	90	21	88	20	89	21	none
				2.5 mg./lb.	87	24	88	23	86	24	none
				3 mg./lb.	84	27	86	25	85	25	salivation
Dog #5 (Mixed Breed)	60	87	19	1.5 mg./lb.	83	19	81	24	80	23	none
				2 mg./lb.	78	25	76	23	77	23	none
				3 mg./lb.	71	29	73	27	71	29	none
Dog #6 (Poodle)	12	89	18	1.5 mg./lb.	87	21	85	20	86	21	none
				2 mg./lb.	81	22	80	24	80	23	none
				3 mg./lb.	77	20	78	21	77	23	none
Cat #1	6.5	115	25	2 mg./lb.	111	28	110	31	111	30	none
				2.5 mg./lb.	108	26	103	41	110	33	some salivation
				3 mg./lb.	102	34	103	36	105	32	copious salivation
Cat #2	15	107	29	2 mg./lb.	101	30	103	33	100	32	none
				2.5 mg./lb.	96	31	93	31	96	32	none
				3 mg./lb.	93	28	91	30	90	30	some salivation
Cat #3	8	117	31	2 mg./lb.	111	31	104	27	109	28	none
				2.5 mg./lb.	106	28	100	26	101	27	none
				3 mg./lb.	98	26	104	29	99	27	none

TABLE 2

RAPACODIN* CLINICAL CASES

***Average Dose: 1 mg. Per Pound of Body Weight, Intramuscularly**

Patient	Weight (Lbs.)	Age	Required Treatment	Surgical Risk Status	Preoperative Rapacodin Dose Total Mg.	Preoperative Rapacodin Dose Mg./ Pound	Status of Patient During Operation: Restraint Required	Respiration Rate	Heart Rate	Nausea-Vomiting	Intestinal Peristalsis	Postoperative Status: Pain-Free	Awake	Ambulatory
Cocker	26	11	anal gland surgery	poor	30	1.15	none	slight increase	slight increase	none	no increase	yes	yes	yes
Mixed Breed	29	10	" " "	poor	30	1.0	none	"	"	none	"	yes	yes	yes
Mixed Breed	46	8	" " "	poor	50	1.1	none	"	"	none	"	yes	yes	yes
Boston Terrier	15	6	" " "	poor	15	1.0	none	"	"	none	"	yes	yes	yes
Cocker	22	6	" " "	good	25	1.1	none	"	"	none	"	yes	yes	yes
Chihuahua	8	5	" " "	fair	10	1.25	none	"	"	none	"	yes	yes	yes
Shelty	28	4	" " "	good	30	1.0	none	"	"	none	"	yes	yes	yes
Chihuahua	16	2	" " "	fair	15	1.0	none	"	"	none	"	yes	yes	yes
Mixed Breed	34	2	" " "	good	35	1.0	none	"	"	none	"	yes	yes	yes
Toy Poodle	6	2	" " "	good	10	1.67	none	"	"	none	"	yes	yes	yes
Schnauzer	25	10 mo.	" " "	good	25	1.0	none	"	"	none	"	yes	yes	yes
English Bull	20	6 mo.	" " "	good	20	1.0	none	"	"	none	"	yes	yes	yes
English Bull	30	6	mastectomy	good	30	1.0	none	"	"	none	not significant	yes	yes	yes
Lab. Retriever	35	8	excise hematoma	poor	30	0.85	moderate	"	"	none	"	yes	yes	yes
Siamese	5	14 wk.	declaw	good	15	2.5	moderate	"	"	none	"	yes	yes	yes
Feline	10	10 mo.	castration	good	30	3.0	none	considerable increase	moderate increase	none	"	yes	yes	yes
Fox Terrier	12	7	dentistry	fair	15	1.25	moderate	slight increase	slight increase	none	"	yes	yes	yes
Chihuahua	15	7	dentistry	fair	15	1.0	moderate	"	"	none	"	relatively	yes	yes
Fox Terrier	12	2	remove foreign body from ear canal	good	15	1.25	partial	"	"	none	"	yes	yes	yes
Fox Terrier	20	3	suture skin wound	good	30	1.5	none	"	"	none	"	yes	yes	yes
Boxer	45	5	painful examination	good	45	1.0	moderate	"	"	none	"	yes	yes	yes
Feline	12.5	4	" "	good	15	1.2	moderate	"	"	none	"	yes	yes	yes
Cocker	7	5 wk.	tail trim	good	10	1.4	none	"	"	none	"	yes	yes	yes
Cocker	30	6	painful examination	good	30	1.0	moderate	"	"	none	"	yes	yes	yes

that this narcotic analgesic consistently produces profound pain relief without significant depression of respiration, circulation or cardiac function. Gastrointestinal upset from Rapacodin is absent in most cases. Rapacodin-induced peristalsis seldom complicates the surgical situation, and the rectum does not have to be packed. Furthermore, this drug does not interfere with early postsurgical ambulation.

An acute toxicity study (See Table 1) established that increasing the intramuscular Rapacodin dose to 3 mg. per pound of body weight (approximately three times the usual therapeutic dose) produced no toxic manifestations in six dogs and three cats used as experimental subjects. At this high level of dosage, respiration tended to be slightly stimulated and the heart rate slightly depressed. But neither respiration nor cardiac function were significantly influenced. The only side effects from the 3 mg. per pound dose of Rapacodin were: bowel movement in one dog, slight salivation in one dog and two cats, and excessive salivation in one cat.

Clinically, as is brought out in Table 2, we found the average optimum intramuscular dose of Rapacodin to be 1 mg. per pound of body weight, with individual doses ranging from 0.85 to 3 mg. per pound of body weight. Freedom from classic morphine side effects made possible individualizing the dose for each patient. For example, an intramuscular dose of 1.67 mg. per pound produced no untoward effects in a 6-pound Poodle. Two poor-risk patients, one a 10-year-old mixed breed and the other an 11-year-old Cocker, did splendidly under doses of 1 mg. per pound and 1.15 mg. per pound, respectively. A 5-week-old, 10-pound Cocker brought in for an ear infection responded excellently to Rapacodin 1.4 mg. per pound of body weight. The animal that received 3 mg. per pound of Rapacodin—three times the average dose—was a 10-month-old cat presented for castration. The respiration, rather than being depressed by this large dose of Rapacodin, was increased.

A sterile solution of Rapacodin 30 mg. per cc. is available in 1 cc. ampules and 20 cc. multiple dose vials. Rapacodin 10 mg., 20 mg., and 40 mg. oral tablets are also available. They can often be used to advantage during the first two or three postsurgical days.

Like most veterinarians, our past experience has made us a bit reluctant to concede that a new drug is necessarily a better drug because of its newness. Our initial clinical experience with Rapacodin has convinced us that this codeine derivative is a most desirable and useful opiate analgesic. We concur with Gravenstein *et. al.* that Rapacodin, 30 mg., is "not significantly less potent than 10 mg. of morphine in the control of moderate and severe postoperative pain." We also agree with their statement that Rapacodin "does not produce the classic side effects produced to a significant degree by morphine."

Our current and most satisfactory preoperative regime for anal gland cases is:

1—A soapsuds enema 12 to 14 hours prior to surgery.

2—A tranquilizer, usually Thorazine 1 mg. per pound of body weight, given intramuscularly an hour before the operation.

3—Fifteen minutes later, an intramuscular injection of Rapacodin, usually 1 mg. per pound of body weight.

4—Some 15 to 20 minutes later, the anal glands are expressed and packed with "playdough" (a child's modelling clay). Following this, a procaine-ephedrine local anesthetic solution is infiltrated around each anal sac.

5—At the end of another 15 minutes, surgical extirpation of the glands is begun.

We find Rapacodin an excellent analgesic and restraint agent in minor surgery and in patients undergoing painful or otherwise disturbing examinations and treatment. For example, we had excellent patient-response to Rapacodin in such procedures as tail trim, castration, hematoma of the ear, foreign body in the ear, and suturing of skin wounds.

Our evaluation of it as preoperative and postoperative medication in anal gland surgical cases is being extended. We will also determine the efficacy and desirability of this narcotic analgesic in other types of major surgery.

Additional and expanded use of this analgesic-antitussive and final evaluation will be reported at a later date.

Observations of Serological Titers of Cattle Vaccinated for Leptospirosis

WILLIAM H. JUSTICE, D.V.M.*
Veterinary Section
North Carolina State College
Raleigh, North Carolina

Leptospiral infections are known to occur in wild and domestic animals throughout the civilized world. In the United States, leptospirosis of cattle may be caused by *Leptospira pomona, L. canicola, L. sejroe, L. grippotyphosa,* and *L. autumnalis.* The greatest number of infections are due to *L. pomona.* This disease causes an estimated annual loss of more than $112 million — the third most costly livestock disease in the United States.[1] In North Carolina there has been an increase in the number of clinical cases seen in the field, and numerous cases have been confirmed in the North Carolina Diagnostic Laboratory.

Until such time as a nation-wide program of control is developed, it appears that vaccination with a leptospira bacterin is desirable to help prevent or stop outbreaks of an infection in individual herds or areas. It has been reported[2,3] that vaccination of cattle with *L. pomona* bacterin afforded protection against infection when subsequently challenged 54 days and 20 months respectively.

The question arises as to what effect such vaccination will have on the serum antibody titer of these animals when tested. The objectives of this study were (1) to determine the serum titers of cattle following vaccination with *L. pomona* by the Stoenner plate test, Galton macroscopic test, and agglutination-lysis test and (2) to compare these titers to those determined by the recently developed Galton macroscopic test.

Materials and Methods

Animals — Fourteen male Holstein calves, ranging in age from 4½ to 5½ months, were used. All calves appeared to be free of disease and were in good physical condition. All calves had negative test for Brucellosis immediately before beginning of experiment and also four weeks after vaccination. These calves were divided into three groups.

Group I consisted of four calves which were vaccinated with 5 ml. Leptogen® (Pitman-Moore) bacterin (No. 1) subcutaneously.

Group II consisted of four calves which were vaccinated with 5 ml. *L. pomona* bacterin (Jen-Sal) (No. 2) subcutaneously.

Group III consisted of six calves, unvaccinated, as controls.

Sera were collected from all calves once

*Diagnostician
Large Animal Diagnostic Laboratory
N.C. State Department of Agriculture

Contribution from the Department of Animal Industry, North Carolina Agricultural Experiment Station, Raleigh.

before vaccination, and at two week intervals for 12 weeks post vaccination. The serum was frozen and stored and all tests were made on the same day using a single batch of antigen.

TABLE 1. Stoenner Plate Agglutination Test Results on Eight *L. pomona* Vaccinated and Six Unvaccinated Calves Two to 12 Weeks Post Vaccination

Calf No.	Treatment	Serological Titers Post Vacc. (weeks)					
		2	4	6	8	10	12
55	Control	-	-	-	-	-	-
56	Control	-	-	-	-	-	-
57	Control	-	-	-	-	-	-
58	Control	-	-	-	-	-	-
59	Control	-	-	-	-	-	-
60	Control	-	-	-	-	-	-
61	No. 2	±	-	-	-	-	-
62	No. 2	±	-	-	-	-	-
63	No. 2	±	-	-	-	-	-
0	No. 2	±	-	-	-	-	-
64	No. 1	±	-	-	-	-	-
65	No. 1	±	-	-	-	-	-
66	No. 1	-	-	-	-	-	-
67	No. 1	-	-	-	-	-	-

± = Doubtful weak agglutination

The following serological tests were conducted:

1. Macroscopic Stoenner plate test[4] using screen test only for *L. pomona;* no dilutions.

2. Galton macroscopic slide test[5] using *L. pomona, L. autumnalis* and *L. sejroe* pooled antigen and each antigen individually, undiluted and 1:5 dilutions.

3. A modified agglutination-lysis test using cultures of *L. pomona* Johnson strain grown for five days in modified Stuart's medium with 10% rabbit serum added. The antigen was examined and found free of "breed nests" and standardized microscopically. Samples were incubated for three hours at 30 C. at twofold dilutions from 1:2 to 1:64.

Results

All calves tested negative before vaccination, and all control calves remained negative throughout the experimental period. Six of the eight calves vaccinated, as shown

TABLE 2. Galton Macroscopic Slide Test Results on Sera Collected Two Weeks Post Vaccination

		Pool #3*	L. pomona			L. autumnalis		L. sejroe
Calf No.	Treatment	Post Vacc.	Undiluted Serum	Serum diluted 1:5 .04 ml.	.02 ml.	Undiluted Serum	Serum diluted 1:5 .04 ml.	Undiluted Serum
55	Control	-	-	-	-	-	-	-
56	Control	-	-	-	-	-	-	-
57	Control	-	-	-	-	-	-	-
58	Control	-	-	-	-	-	-	-
59	Control	-	-	-	-	-	-	-
60	Control	-	-	-	-	-	-	-
61	No. 2	2+**	2+	1+	-	1+	-	-
62	No. 2	2+	2+	1+	-	1+	-	-
63	No. 2	2+	2+	1+	-	1+	-	-
0	No. 2	2+	2+	1+	-	1+	-	-
64	No. 1	2+	2+	1+	-	1+	-	-
65	No. 1	3+	3+	1+	-	1+	-	-
66	No. 1	1+	1+	-	-	-	-	-
67	No. 1	1+	1+	-	-	-	-	-

*Pool of *L. autumnalis, L. pomona* and *L. sejroe* antigen.
**Degree of agglutination is recorded as 1+, 2+, 3+ or 4+.

in Table 1, gave a weak non-diagnostic reaction on Stoenner screen plate test two weeks after vaccination. The same six calves gave a weak cross agglutination with *L. autumnalis*. The results of the Galton macroscopic slide test are shown in Table 2. Only one vaccinated calf had 3+ titer for the *L. pomona, L. autumnalis* and *L. sejroe* pooled antigen; all other vaccinated calves had 2+ or 1+ titer. The results of the agglutination-lysis test are shown in Table 3. One calf had weak agglutination at 1:32 dilution on agglutination-lysis test. Four of eight calves had a titer of 1:16; six had a titer of 1:8; all eight had titers of 1:4. The results of the three serological procedures are shown in Table 4 for comparison.

TABLE 3. Agglutination-lysis Test on Sera Collected Two Weeks Post Vaccination

Calf No.	Treatment	Post Vaccination Dilution 1:2	1:4	1:8	1:16	1:32	1:64
55	Control	-	-	-	-	-	-
56	Control	-	-	-	-	-	-
57	Control	-	-	-	-	-	-
58	Control	-	-	-	-	-	-
59	Control	-	-	-	-	-	-
60	Control	-	-	-	-	-	-
61	No. 2	3+*	2+	1+	-	-	-
62	No. 2	3+	2+	1+	1±	-	-
63	No. 2	3±	2±	1+	-	-	-
0	No. 2	3+	2+	1+	1+	-	-
64	No. 1	3+	2+	1+	1+	-	-
65	No. 1	3+	2+	2+	1+	1+	-
66	No. 1	2+	1+	-	-	-	-
67	No. 1	2+	1+	-	-	-	-

*Agglutination recorded as
1+ = 1-25% agglutination
2+ = 25-50% agglutination
3+ = 50-75% agglutination
4+ = 75-100% agglutination

Discussion

When calves 4½ to 5½ months of age were vaccinated with *L. pomona* bacterin, no serologically significant titers were developed. There were no clear-cut agglutinations using the Stoenner plate test method (Table 1). With the Galton macroscopic slide test weak agglutination was noted, as it was not apparent beyond the first dilution (Table 2). With the agglutination-lysis test, there was no titer beyond 1:32 (Table 3). This is in the lower limits of vaccination titers as reported by York[4] *et al.* in which he reported a range of 1:20-1:160.

In the N.C. Diagnostic Laboratory no diagnostic significance is given to titers which are not clear positives on the Stoenner plate test at least in the 1:40 dilution. or beyond the second dilution (Galton macroscopic slide test) using .02 ml. of 1:5 serum dilution, or positive at least in the 1:100 dilution on agglutination-lysis test.

Gillespie and Kenzy[3] reported that heifers vaccinated with *L. pomona* bacterins exhibited some degree of protection against

TABLE 4. Comparison of the Results of These Serological Test Methods for *L. pomona* Using Sera That Gave an Incomplete Agglutination on the Stoenner Plate Test Two Weeks Post Vaccination

Calf No.	Treatment	Stoenner Plate Test	Galton Macroscopic Undiluted Serum	Serum Diluted 1:5 Plated on Test .04	.02	1:4	Agglutination-lysis Dilutions 1:8	1:16	1:32	1:64
61	No. 2	±	2+	1+	-	2+	1+	-	-	-
62	No. 2	±	2+	1+	-	2+	1+	1+	-	-
63	No. 2	±	2+	1+	-	2+	1+	1+	-	-
0	No. 2	±	2+	1+	-	2+	1+	1+	-	-
64	No. 1	±	2+	1+	-	2+	1+	1+	-	-
65	No. 1	±	3+	1+	-	2+	2+	1+	1+	-

infection when challenged at a later date. York[6] and Brown[7] *et al.* reported that even though low titers were developed in cattle, protection was afforded.

Summary

1. Calves vaccinated with *L. pomona* bacterins, ranging in age from 4½ to 5½ months showed no significant rise in titer due to vaccination.

2. Test results of three serological procedures are presented.

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Advisory Board members of the Morris Animal Foundation discuss a proposal at their annual meeting in Boulder, Colo., July 6. Left to right, seated, are Dr. Charles W. Bower of Topeka, Kan.; Dr. E. C. Stone, Dean at Washington State University; Dr. William D. Carlson, Colorado State University; and standing, Dr. William J. Zontine, Lancaster, Calif.; and Dr. Clarence R. Cole, Ohio State University.

C. B. BJORNSON, JENNY TURN, D. F. EVELETH
Dept. of Veterinary Science
N. D. Agricultural Experiment Station
Fargo, North Dakota

Listeria Monocytogenes Isolated From A Mummified Bovine Fetus

Listeria monocytogenes is generally considered to be the etiological agent of encephalitis in cattle. Graham and his associates[1] first incriminated this organism as a cause of abortion in cattle. There have been a limited number of reports of bovine abortion caused by this organism since the original one.

The literature on listeriosis abortions in the bovine have been reviewed to 1955 by Smith, Reynolds and Bennet,[2] and Gray to 1960.

In none of the cases reported was a description of a mummified fetus made. The aborting cows usually did not show severe symptoms of a systemic reaction prior to or following the abortion.

The following case illustrates the fact that abortion may take place and the dam may not be observed to be ill and that the fetus may be dead for some time prior to its expulsion.

Case report: On April 28, 1960 a bovine fetus was presented to this laboratory for diagnosis. It came from a brucellosis and vibriosis-free herd. The fetus had been found in a corral in which there were purebred Angus, Shorthorn and Hereford cows. The herdsman could not identify the breed of the fetus nor could he find any cow showing signs of recent parturition.

Post-mortem examination showed a bovine fetus estimated at four to five months gestation but devoid of hair and with a skin that was so leathery that it was difficult to cut. The internal organs of the fetus presented no gross pathology other than extreme dehydration. There were some areas of subcutaneous edema.

On culture of the tissues, an organism resembling *L. monocytogenes* was isolated. The organism was identified as Listeria by cultural and staining characteristics, animal pathogenicity and by the conjunctivitis produced when a guinea pig's eye was swabbed with a pure broth culture.

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This is a progress report on Project H-16-5

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Studies on Bovine Staphylococcal Mastitis

Formulation of Immunizing Agents

L. W. FLEMING
Department of Biological Research
Jensen-Salsbery Laboratories, Inc.
Kansas City, Missouri

Staphylococcal infection in the bovine may be associated with a variety of pathological conditions, but mastitis is unquestionably the most important of these conditions from an economic standpoint. As antibiotic resistance has become more common, interest has regenerated in the possibility of active immunization of dairy cattle against staphylococcal mastitis.

It is paradoxical that the ubiquitous staphylococci are such complex microorganisms. Despite a large amount of investigation during the past few years, little progress has been made on the basic problem of determining which of the so-called "virulence factors" are actually responsible for causing disease. In the annals of microbiology, however, it is not unique that an empirical approach to vaccination has preceded a thorough understanding of the essential mechanisms involved.

It would seem that most mastitis investigators are convinced that the extracellular hemolysins produced by staphylococci play a major role in the disease. Prior to 1946, however, the results of mastitis investigation

prompted Little and Plastridge[1] to conclude that staphylococcal toxoids were unlikely to be of value in the prevention of staphylococcal mastitis. Fortunately, more recent work has not substantiated this conclusion. As more basic details of toxoid formulation are established, successful immunization of dairy cattle against staphylococcal mastitis will soon be a reality.

Between 1951 and 1953, Ramon and other French investigators demonstrated the advantages of inactivated bacterial cells and alum in staphylococcal toxoids. Higher antitoxin titers were obtained in such products and the titers persisted for a longer time. These observations were subsequently confirmed by several workers.[2,3,4] Ramon and his co-workers[5] also advocated the inclusion of both alpha and beta fractions in staphylococcal toxoids. Most toxoids used in staphylococcal mastitis studies have not been standardized preparations. Too frequently there has been no attempt whatever to quantitate the toxin content of cultures intended for toxoid formulation. In view of the generally accepted opinion that beta hemolysin is more characteristic of pathogenic staphylococci isolated from animals,[6] it is also surprising that less attention is accorded this fraction than the alpha fraction.

After studying an autogenous bacterin-toxoid for prophylaxis of staphylococcal udder infections in dairy cows, Pearson[3] noted that a number of phage types were pathogenic for cattle. The implications of bacteriophage typing are not fully understood, but the technic has been valuable in the problem of differentiating staphylococcal strains. Many investigators[7,8,9,10,11] have used the technic to classify staphylococci from bovine udders, and certain consistencies in phage types have emerged. Types 42D, 44A, and 81 predominate in most countries where studies of this nature have been conducted. Blair[12] has reported that there is a considerable degree of group specificity among staphylococci typed by the bacteriophage technic. One might conclude that a staphylococcal bacterin-toxoid would have more universal usefulness if it were formulated from cultures representing most of the broad bacteriophage groups.

Perhaps the most neglected aspect of biological manufacturing is the use of inactivating agents. There is an obvious need for new agents which are both effective and produce a minimal deleterious effect on antigenicity. The difficulties of inactivating potent staphylococcal toxins with formaldehyde are well known. Weeks of incubation are sometimes required to produce a safe product, during which time deterioration of antigenicity is accelerated. We have studied beta propiolactone (BPL) as a toxoiding agent and find it to have several advantages over formaldehyde. Detoxification is accomplished quickly and irreversibly and a superior antigen is produced. Moreover, irritation or general adverse symptoms are completely lacking when the product is injected in animals.

A vaccine prepared in such a manner as to incorporate all the facts, suggestions, and ideas discussed above would seem worthwhile. This paper presents some of the results of our attempts during the past two years to develop such a vaccine.

Materials and Methods

Approximately 130 staphylococcal isolates were collected from proven cases of bovine mastitis in the United States and England. With few exceptions, the isolates were *aureus* species and positive in standard coagulase tests. Phage types were established by Dr. C. A. Hunter of the Kansas State Board of Health using the technic of Blair.[13] The isolates were screened for toxigenicity by growing the organisms at 37° C. in brain-heart infusion broth (Difco) for 64 hours in an atmosphere containing 20 percent CO_2 and 80 percent O_2. The cultures were subsequently centrifuged and the supernatant tested for hemolytic activity against rabbit and sheep erythrocytes. Beginning with a 1:5 dilution of the supernatant material, twofold dilutions were made in saline. One ml. quantities of the various dilutions were mixed with an equal amount of a two percent suspension of thrice-washed

rabbit or sheep erythrocytes. Alpha toxin titers were determined as the highest dilution which developed any degree of hemolysis after three hours at 37° C. Beta toxin titers were recorded as the difference between the highest dilution which developed any degree of hemolysis after three hours at 37° C. and after overnight refrigeration.

Antitoxin was measured by the hemolytic method. Serum was diluted in saline to produce only two units between successive dilutions. One test dose (Lh) of either alpha or beta toxin, contained in 0.5 ml. of saline, was added to an equal volume of the various serum dilutions. After 20 minutes at room temperature, one ml. of a one percent suspension of either rabbit or sheep erythrocytes was added to each tube. The tubes were incubated for one hour at 37° C. and the results read after overnight refrigeration. Antitoxin content for both the alpha and beta fractions was determined from the highest serum dilution which showed a two-plus (50 percent) hemolysis. Antitoxin units per ml. of serum were calculated by multiplying the reciprocal of the serum endpoint dilution times two.

Lh doses of alpha and beta toxins were determined with the aid of standard antitoxins. Standard alpha antitoxin was obtained from the U. S. Department of Health, Education, and Welfare (Division of Biologics Standards); beta antitoxin was supplied by the Connaught Medical Research Laboratories of Toronto, Canada. One unit of standard antitoxin, contained in 0.5 ml. of saline, was mixed with varying amounts of toxin, also in 0.5 ml. of saline. Further manipulations were identical to those described above for antitoxin determination. One Lh dose of either alpha or beta toxin was considered to be that amount of toxin which produced a two-plus (50 percent) hemolysis when combined with one unit of standard antitoxin.

Experimental bacterin-toxoids were prepared by growing the staphylococci at 37° C. in brain-heart infusion broth under an atmosphere of 20 percent CO_2 and 80 percent O_2. Cultures were incubated for 36 hours with continual agitation. Lh dose determinations were made on all cultures prior to toxoiding with BPL. An amount of BPL was used sufficient to render the toxins innocuous by three different criteria: (1) three-plus hemolysis, or less, following incubation of equal volumes of undiluted culture and one percent suspensions of rabbit and sheep erythrocytes, (2) survival of white mice following the intravenous injection of 0.4 ml. of culture, (3) survival of rabbits following the intravenous injection of culture to the extent of 3 ml. per kilogram of rabbit weight. Detoxification was usually accomplished in six hours, and satisfactory cultures were subsequently precipitated with aluminum hydroxide and preserved with merthiolate.

Results and Discussion

As expected, our culture collection demonstrated large differences in toxin production among the individual strains. Some alpha toxin was produced by nearly every strain tested, but it was not uncommon for cultures to produce no demonstrable beta toxin.

TABLE 1. Alpha Toxin Titers of Staphylococci Grown in Various Media*

Sampling times	Medium #1	Medium #2	Medium #3	Medium #4	Medium #5	Medium #6
40 hours	1:640	1:320	1:160	1:80	1:160	1:160
53 hours	1:1280	1:320	1:160	1:160	1:640	1:160
70 hours	1:1280	1:320	1:160	1:320	1:640	1:160

*Composition of media: #1—brain-heart infusion broth; #2—nutrient broth, 0.2% Na_2HPO_4, 0.2% dextrose, 0.5% NaCl; #3—nutrient broth; #4—1.5% N-Z amine (Sheffield), 0.3% yeast extract, 0.25% NaCl, 0.6% Na_2HPO_4, 0.5% dextrose; #5—trypticase soy broth, 0.3% yeast extract; #6—nutrient broth, 0.1% agar.

From the results of our screening work, several highly toxigenic strains were selected for future studies. Bacteriophage typing showed that the majority of our typable isolates were either group III or IV staphylococci. These results agree with those referred to earlier in this paper.

Many fluid media were studied to find a good substrate for toxin production. Thirty ml. quantities of the various media were placed in 50 ml. flasks and inoculated with strain #78 (group III). The flasks were subsequently incubated at 37° C. with continual agitation in an atmosphere containing 20 percent CO_2 and 80 percent O_2. Small aliquots were withdrawn at prescribed time intervals, and tested for alpha toxin content by the hemolytic method previously described. Table 1 shows the results of this study.

These results emphasize the importance of a suitable medium if potent toxins are to be produced. A total of 19 different media formulations were studied, but none produced better toxin than brain-heart infusion broth.

The antigenicity of several experimental toxoids and bacterin-toxoids was studied in normal rabbits. Objectives of this work were to evaluate beta propiolactone and formaldehyde as toxoiding agents, and to determine the antigenic advantages of incorporating adjuvants and bacterial cells in the toxoids. Strain #78 was grown in brain-heart infusion broth for 36 hours under conditions described previously. Cells were separated by centrifugation and the toxic supernatant fluid was Seitz-filtered. All of the experimental formulations were prepared from the same batch of toxin, which had an alpha toxin Lh dose of 0.045 ml. Homologous bacterial cells were heat-inactivated before recombining with toxoid at a concentration of two billion cells per ml. of product. Groups of seven rabbits were given a series of three intramuscular injections at weekly intervals, commencing with 1 ml. of the various experimental products and increasing by 1 ml. on each successive injection. Blood samples were collected one week after the final injection and the sera were assayed for alpha antitoxin content. The following table shows the average antitoxin unitage developed by each of the experimental products.

TABLE 2. Antigenic Response of Rabbits to Various Staphylococcal Products

Product identification	Alpha antitoxin units/ml. serum*
BPL-inactivated toxoid	11.4
BPL-inactivated toxoid + cells	11.7
BPL-inactivated toxoid + adjuvant	16.7
Formaldehyde-inactivated toxoid	9.7
Formaldehyde-inactivated toxoid + adjuvant	12.3

*Each figure represents the average antitoxin unitage from seven rabbits.

These results suggest an advantage in using BPL as an inactivating agent for staphylococcal toxins. Preliminary studies with the agar-gel diffusion technic have also indicated that formaldehyde alters the antigenicity of staphylococcal toxins to a greater extent than does BPL. Against a potent antitoxin, not only were more precipitation lines formed with a BPL-inactivated toxoid than with a formaldehyde-inactivated toxoid, but the lines were also heavier. The above results also suggest that an adjuvant such as aluminum hydroxide may enhance the antigenic response. Inactivated bacterial cells did not demonstrate a significant adjuvant effect on the antitoxin levels, but their inclusion in toxoids for purposes of eliciting antibacterial substances seems valid.

Several multistrain toxoids have been tested in rabbits and found to elicit approximately the same antigenic response as did monostrain toxoids. For a typical study, whole cultures of four different strains (representing three bacteriophage groups) were inactivated with BPL and subsequently mixed in equal proportions. The bacterin-toxoid was precipitated with aluminum hydroxide and preserved with merthiolate. Prior to toxoiding, the average alpha toxin Lh dose was 0.045 ml. and the beta toxin Lh dose was 0.030 ml. A group of eight rabbits was immunized by the schedule described previously and their resulting antitoxin titers are shown in Table 3 below. A small herd of Holstein dairy cows was

TABLE 3. Antigenic Response of Rabbits and Cows to a Multistrain Staphylococcal Bacterin-Toxoid

Rabbit numbers	Antitoxin units/ml. serum alpha	beta*	Cow numbers	Antitoxin units/ml. serum alpha	beta*
16	16	80+	1	24	36+
23	8	130	3	16+	16+
25	10	120+	4	16	28+
26	52	120+	7	10	8
826	8	110	10	40	40+
827	8	48	14	14	28
837	12	58	15	12	28
838	10	1	17	16+	16+
			18	16	8
			20	2	3

*Plus (+) indicates samples with insufficient serum to determine true endpoints.

also injected with this product. Two 5 ml. doses were given intramuscularly at a two-weeks interval. Ten days after the second injection, the cows were bled and antitoxin levels determined on the sera. Table 3 also presents the results of this study.

Summary

Recent work on the problem of staphylococcal infections has established groundwork for a fundamental approach to active immunization. The use of toxoids and bacterin-toxoids for the prevention of staphylococcal mastitis in cattle has been discussed and certain inadequacies noted. Based on results and observations from systematic laboratory studies, the following recommendations seem warranted for the production of a good immunizing agent:

(1) Highly toxigenic strains of staphylococci should be used.

(2) A multistrain preparation based on bacteriophage typing should have more universal usefulness.

(3) Standardized amounts of alpha and beta toxoids should be included in the product.

(4) An adjuvant such as aluminum hydroxide has definite antigenic advantages.

(5) The inclusion of cells for purposes of eliciting beneficial antibacterial substances seems valid.

(6) An inactivating agent such as beta propiolactone would produce a more antigenic toxoid than formaldehyde.

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FDA Proposes Clearance on Mineral Feed Compounds

A revised Food and Drug Administration proposal for safety clearance of 42 compounds serving as sources of minerals in animal feeds was announced July 12, 1960.

Specific limits are proposed only for the addition of cobalt and copper to animal feeds. The other minerals would be regarded as safe when used in accordance with good feeding practice to supply nutrient requirements, taking into account the mineral content of available feed and the environment in which the animal is grown.

Today's proposal would place a safe limit for added cobalt at no more than one part per million in the daily feed intake of nonruminants, such as swine and poultry; and for added copper, at no more than ten parts per million in the daily intake of sheep. The safe limit for copper rests on the observation that the normal growth of sheep on western ranges is inhibited with the addition of copper salts in excess of ten parts per million of the ration.

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Automatic projectile type syringe delivered by a specially designed pneumatic rifle.

Excellent for immobilizing, capturing, restraining or treating wild or feral animals.

Effective for animals of all sizes. From one to ten milliliters of any liquid compound can be injected into an animal from distances up to approx. 50 yards.

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French Graduates Visit U. S.

Dr. Samuel Scheidy (center), Veterinary Medicine Director at Smith, Kline & French Laboratories in Philadelphia and president of the American Veterinary Medical Association, welcomes a group of 40 recent graduates of the Ecole Nationale Veterinaire in Alfort, France. The students, on a month-long tour of Eastern veterinary schools and research centers, toured the SK&F plant after spending several days at the veterinary school at the University of Pennsylvania. SK&F entered the field of veterinary pharmaceuticals and biologicals in January when it purchased Norden Laboratories of Lincoln, Nebraska. Students will visit Washington, D. C., Lexington, Indianapolis, Chicago, Kalamazoo, Ithaca, Montreal and Guelph, Ontario, before returning to France in late July.

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...now available in 100 cc. (10-dose) vials. Fast, effective — eliminates problem of antibiotic or sulfa residues in market milk.

The 100 cc. vial adds a new measure of convenience to Neothion – the exclusive Squibb formula that controls mastitis quickly and dependably *without hazard of residues in market milk and without hazard of penicillin sensitization.*

Neothion contains the exclusive Squibb antibiotic, thiostrepton, plus neomycin, incorporated in the exclusive Squibb vehicle, Plastibase. Neothion eliminates all problems of antibiotic or sulfa residues when dairymen withhold milk for 72 hours following your final treatment. Neothion does not "gum up" in the quarter to cause post-72 hour residues. Dairymen can sell their milk without fear of contamination. Furthermore, the unsalable milk withdrawn from the untreated quarters during the 72-hour period can be advantageously fed to calves and other stock.

BROADER SPECTRUM. Neothion controls all nine types of mastitis-causing bacteria, including strains of staphylococci that are now resistant to other antibiotics or combinations of antibiotics. Neothion controls chronic and acute mastitis with a *broader spectrum of activity* than the three brands of broad spectrum antibiotics . . . the triple sulfas . . . streptomycin . . . or neomycin used alone. Neothion is sold only to veterinarians.

ADMINISTRATION: Withdraw Neothion from 100 cc. 10-dose vial with standard 14 to 16 gauge sterile needle. Change to teat-cannula type needle for instillation into quarter. The dose is 10 cc. for each infected quarter every 12 hours.

NEOTHION is also available in single-dose disposable plastic syringes containing 50,000 units of thiostrepton plus 150 mg. of neomycin.

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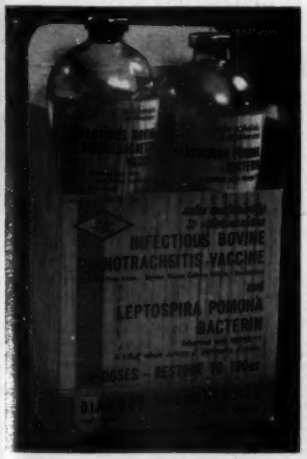
This department will announce each issue new therapeutic items, equipment, services, and literature of interest to veterinarians. All claims made are those of the firms concerned. Send communications to the address noted.

Reader's Service

A new COMBINATION VACCINE has been developed for the prevention of Infectious Bovine Rhinotracheitis and Leptospirosis in cattle. The product, called Rhino-Lep, was developed by Diamond Laboratories, Des Moines, Iowa. With the growing trend toward more feed lots throughout the United States the new combination vaccine will cut down the time and work that is required in vaccinating each animal that is introduced into the feed lot. It will necessitate one injection instead of two.



The Infectious Bovine Rhinotracheitis fraction is a vacuum dried, modified live virus of bovine tissue culture origin. The Leptospira Pomona fraction is an inactivated whole culture and is used as the diluent for reconstituting the Infectious Bovine Rhinotracheitis fraction. The Leptospira fraction is absorbed with the new adjuvant, Neojel, to permit longer immunity, better toleration and reduced dosage. The new vaccine is available through veterinarians only.

A new ANTISTRESS-ANTIBACTERIAL DRUG has been introduced to the veterinary profession by Schering Corporation. According to results of clinical evaluation in the field with dogs, cats and horses, Azimycin has proved highly effective in treating respiratory infections such as pneumonia and bronchitis, allergic skin conditions with secondary infections, infection and stress prevention before and after surgery and other conditions.

Azimycin aqueous suspension contains dexamethasone, procaine penicillin G, dihydrostreptomycin and chlorpheniramine maleate. The steroid gives antistress support while the two antibiotics attack the bacterial infection. The antihistamine blocks possible allergic reactions. The new drug is available through graduate veterinarians only.

Watch for symptoms . . .

Lepto May Come in Disguise

THERE are many "look alike" diseases affecting farm animals. Right now, one which is causing particular concern both to farmers and to livestock health authorities is a complicated problem known as leptospirosis which is causing more than $112 million a year losses in cattle alone.

One of the big difficulties about recognizing and dealing with "lepto" is that it resembles brucellosis in so many ways. In fact, the full extent of the disease in this country has appeared largely as a result of

In swine, the disease may exist without any apparent symptoms, while in other cases there may be abortions, scouring, loss of appetite—and in severe cases, blood-tinged urine.

As is evident, the chances of confusing leptospirosis with brucellosis are very great, especially with reference to abortions and interrupted breeding schedules. The scouring symptom, also, leads to confusion, as scouring is common to so many other diseases of swine and cattle. For this reason, when

in controlling the disease. Thus, if any cattle or swine show symptoms which may indicate brucellosis or "lepto," tests should be made to determine the cause of the condition.

The most important thing to remember is that methods of vaccination have been developed by which leptospirosis can be pre-

Mass Movement Of Stock Always Poses Problem

Annual movement of cattle and sheep from ranges into the farm feedlots of the nation will soon be starting. One of the biggest transportation tests of the year, this mass-movement of livestock results in heavy losses caused by shipping fever, according to the American Foundation for Animal

that the muscles used to expel the gas are inhibited by certain substances. It also is believed by some that "agonin," which are highly concentrated in legumes, affect surface tension. The result is a light, frothy mixture in the rumen which prevents gas from rising readily to the top where it is more easily expelled.

Other theories on the cause of bloat include overfeeding, use of rations to which animals are not accustomed, heredity, soil fertility and climate and weather conditions.

There also is a different of opinion as to how bloat kills. One theory is that the pressure of the increased volume of gas in the rumen causes suffocation by choking the breathing and heart of blood. Another is that

HOG CHOLERA

TAKE only enough hog cholera virus to cover the head of a pin and you can start an outbreak of the most costly single swine disease known in America.

This fact about the nation's No. 1 swine killer assumes special importance for hog producers just now, with the season for heaviest outbreaks of cholera immediately ahead.

"killed" virus vaccines. Each place, but the exact selection matter for the experts.

Authorities have been constantly worried about the hog cholera situation in the past several years because widespread vaccination for the disease under much better control, some farmers seem to have lulled into a false sense of security, and can

Baby Pig Ailments Costing Nearly Half Billion a Year

Anemia, Scours and Transmissible Gastro-Enteritis Are the Problems Which Take the Heaviest Toll —Treatments and Cures Available for First Two.

BABY pig problems are costing America's farmers the almost unbelievable sum of nearly a half billion dollars a year.

On one farm the trouble may be pig scours, either it's anemia, or the combined cost of these and other baby pig problems reaches an astonishing

Special Control

The toll of baby pig is now so great that effort is being made to concentrate preventive steps against these this month the

Sheepmen Could Stop Ketosis But They Don't

PREGNANCY disease is no respecter of sexes. It attacks fat ewes as well as those in poor condition, and it causes sheep producers an estimated annual loss of animals and wool amounting to more than $1,782,000.

Pregnancy disease is most often

One of the main causes of the trouble is the tremendous growth of the unborn lamb during the final stage of pregnancy, thus increasing the ewe's nutritional requirement. If this requirement is not met, the sugar level in the ewe's blood drops, causing

More Veterinary Public Relations

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Swine Erysipelas Causes $25 Million Annual Loss

Swine erysipelas causes an estimated annual production loss of $25,000,000. It is one of the most widespread and costly of all known diseases of swine.

diseases with which it appears. This type may be evidenced by the sudden death of one or more hogs before there are any visible symptoms at all.

Acute erysipelas occurs most often in growing pigs. It is the form of the disease which

recent past, and on farms where there is a history of the disease.

Special checks should be made on the health and origin of animals purchased as replacement stock, and such replacement stock should be isolated at least 30 days and watched for possible symp-

veterinary advice

a one-two punch—

infertility, sterility

LAMBING PARALYSIS

PREGNANCY disease is no respecter of sexes. It attacks fat ewes as well as those in poor condition, and it causes our sheep producers an estimated annual loss of animals and wool amounting to more than $1,782,000.

The problem is so great that a special effort in it this month a

that feeding is not interrupted, and that the animals have access to water, minerals and salt. The pregnant ewes should also receive plenty of exercise to keep liver fat.

America's sheep have been living with th

ALMOST EVERY livestock owner is having, or will have, his profits sabotaged this year or next by the "one-two" punch of infertility and sterility.

Cattle are the chief victims of both infertility and sterility. Swine second, sheep a poor third.

Some estimates figure the third of all cattle develop any of reproductive problems at or another. Other estimates c that breeding efficiency can duced as low as 60 to 80 per many herds.

What are some of the comm productive problems, and wh the herd or flock owner do them? In condensed form, her how, what they look like, an to do:

TRICHOMONIASIS — Th cause cows to lose their It is transmitted by infected If a checkup proves the disea prevent, the infected bull d treated and the disease cleare

Equally important is a pre program. In purchasing replac bulls, their records should be and their performance w

In dealing with swine brucellosis, blood-testing is also a sound starting point. Those pigs which react to the test are marketed, equipment, quarters and premises are disinfected. Then, the remaining pigs are re-tested at intervals and further

LEPTOSPIROSIS

THERE are many "look alike" diseases affecting farm animals. Right now, one which is causing particular concern both to farmers and to livestock health authorities is a complicated problem known as leptospirosis, which is causing more than $112,000,000 a year losses in cattle alone.

One of the big difficulties about recognizing and dealing with "lepto" is that it resembles brucellosis in so many ways. In fact, the full extent of the disease in this country has appeared largely as a result of our intensified drive against brucellosis. Now, as the drive progresses and widens, we learn that many cases which were thought to be brucellosis are actually its "second cousin," leptospirosis.

Leptospirosis has now been reported in 30 states, and is believed to

often affected by a very s of this disease, which causes scouring in addit other common symptoms.

In swine, the disease without any apparent while in other cases the abortions, scouring, loss —and in severe cases, b urine.

As is evident, the chan fusing leptospirosis with are very great, especially erence to abortions and breeding schedules. The symptom, also, leads to co scouring is common in so diseases of swine and catt reason, when symptoms the first step is to have arian identify the exact ganism. He may do this tory tests of blood, urine, o sections. Only when the

Pneumonia-Enteritis

A DOUBLE-BARRELED disease which attacks young calves, causing scouring and pneumonia complications, is especially prevalent this time of year on Pennsylvania farms. Loss from this cause in the Keystone state is estimated at one and one-half million dollars.

That is the word about this disease, called "pneumonia-enteritis complex" issued this month by the American Foundation for Animal Health.

Pneumonia-enteritis usually is two diseases—pneumonia and scours. Either disease is serious, but when a calf is stricken by both at the same time, the danger is greatly increased.

Generally, the disease attacks younger calves, from the

Bloat Adds Up to Heavy Losses

LUSH, FRESH PASTURES, especially legumes, can cause real trouble for stockmen. Annual loss for bloat is now estimated by the American Foundation for Animal Health to exceed $60 million.

The condition of bloat is simple—an excessive accumulation of gas in the rumen, gas which the animal cannot expel. The cause is less certain.

A widespread theory is that legume pastures are risky because the animals do not eat enough roughage to activate

Watch "Pinkeye"

Most every Wyoming livestock producer is familiar with the age-old problem of "pinkeye", but few realize that it is still costing a total of more than $50,000,00 a year, nation-wide.

In an effort to get something done about these losses, pinkeye has been chosen as a special object of attack as part of National Livestock Loss Prevention Year.

This problem reaches its peak in the summer. It takes its greatest toll among cattle. There are a number of steps which can be

'Pinkeye' Problem Costs Farmers $50 Million Yearly
Alert Farmers To Hog Disease
Don't Relax Defense Against Hog Cholera!
Anaplasmosis Cuts Cattle And Sheep Profits
Internal Parasites Claim Heavy Livestock Toll
WATCH KETOSIS!
It Sneaks Up On High Producing Cows
Infertility and Sterility Sabotage Farmers' Profi
Nutritional Diseases Must Be Nipped In Bud
Green Pastures Can Be Big Cause of Livestock Trouble
Bloat, Which Results in 43 Million Dollars Damage Per Year, Is Connected With Grazing Fresh, Lush Legumes—Management Is Only Method of Control.
Fall Is The Time To Watch For . . .
Shipping Fever
Swine Erysipelas

Thousands of farm magazine articles like these, telling of the value of veterinary service. Many thousands more in newspapers, plus radio, television. Underwritten by these member companies . . .

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The Gregory Laboratory, Inc.
The National Laboratories Corp.
Allied Laboratories, Inc.
Blue Cross Serum Co.
Corn Belt Laboratories, Inc.
Corn States Laboratories, Inc.

(Reader's Service cont'd)

A new modified LIVE VIRUS VACCINE that is safer and more potent for the prevention of distemper in dogs has been approved by the U. S. Agriculture Research Service and is available to veterinarians from Pitman-Moore Company. Called Tissuvax D-H, it is the first distemper immunizing agent to be produced by the new tissue culture technic, the same basic method used in making Salk polio vaccine. The new vaccine also contains modified live virus of canine infectious hepatitis, developed earlier, giving the puppy double protection with a single immunization.

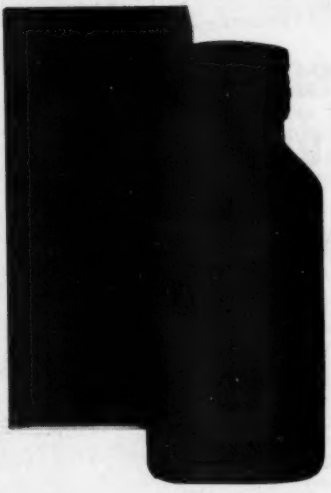
The disease viruses used in the vaccine have been modified or "tamed" so that they provide immunity by causing the production of disease-fighting antibodies, but do not cause the disease. The vaccine has been under development for over two years.

A single dose of the new vaccine provides on the average 50 times the immunity-producing antibodies as does the egg-produced type, which is attributed in part to the absence of the egg protein. In a theoretically "perfect" vaccine one virus unit would be equivalent to one immunizing dose. Tissuvax D-H is the first distemper vaccine to approximate this ideal ratio, being able to produce, under controlled experimental conditions, significant antibody response with only 3.5 virus units.

In addition to the advantages of increased safety and effectiveness, the small dosage permitted with the tissue culture vaccine means less discomfort for the dog, especially the smaller breeds. Only 1 cc. of the combined distemper-hepatitis vaccine is required for a single inoculation. Pitman-Moore Company, a division of Allied Laboratories, Inc., pioneered the use of tissue culture technic in the production of vaccines for veterinary medicine, and is presently constructing a $1.5 million building at its biological laboratories which will be devoted entirely to vaccines using this method.

TEMARIL-P tablets, first oral antipruritic for small animals, is announced by Norden Laboratories, Inc., Lincoln, Nebraska, a subsidiary of Smith Kline & French Laboratories of Philadelphia.

A modification of Temaril, developed by SK&F to treat itching accompanying a variety of human ills, Temaril-P provides two-way action in combating small animal skin disorders. Temaril (trimeprazine—a phenothiazine derivative) relieves both mild and severe pruritus while prednisolone alleviates inflammation associated with most skin conditions.



Clinical studies in small animals have proved Temaril-P effective in relieving itching and reducing inflammation of skin disorders including eczemas, fungus infections, otitis, and dermatitis (allergic, parasitic, pustular and non-specific).

By relieving the desire to scratch, lick and bite skin lesions, Temaril-P reduces or eliminates the need for adjunctive therapy. The product often controls itching which does not respond to any other therapy.

Temaril-P is available in bottles of 100 tablets. For further information, write Norden Laboratories, Inc., Box 1227, Lincoln 1, Nebraska.

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in necrotic enteritis (S. choleraesuis) of swine

FURACIN WATER MIX affords a swift, effective means of suppressing and preventing those serious herd outbreaks of infectious necrotic enteritis of swine. Since scouring pigs "off feed" often continue to drink, "Medication through the drinking water appears to be the method of choice when large numbers of pigs are involved. . . . FURACIN WATER MIX is well adapted to this kind of medication."[1] In this same study, results of bacterial sensitivity testing revealed, ". . . FURACIN was the most consistently effective drug against the various strains of E. coli, and against S. choleraesuis (necrotic enteritis)."[1]

in gray droppings of mink

Symptomatic improvement usually occurred within one week with FURACIN WATER MIX. "After 5 weeks' medication, 100% of the mink had normal feces."[2] "At pelting time, the medicated mink showed good flesh, large size, and bore a good quality pelt, while the untreated controls, showed signs characteristic of gray diarrhea: dehydration, lack of body fat, small body size, and poor fur quality."[3]

in cecal coccidiosis of poultry

"a valuable agent in preventing or reducing mortality . . ."[4] due to Eimeria tenella

in intestinal coccidiosis of poultry

". . . FURACIN was effective in preventing mortality due to initial infections with E. necatrix. . . ."[5]

SUPPLIED: Carton of 330 Gm. and the new carton of 25 pounds. Available from your professional veterinary distributor.

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Dr. Omohundro Reassigned To USDA Post

Appointment of Dr. R. E. Omohundro as Assistant Director (Field Direction) Animal Disease Eradication Division, Agricultural Research Service, USDA, has been announced. Dr. Omohundro was formerly Chief Staff Officer, Poultry Disease Section, Animal Disease Eradication Division, Washington, D. C.

Greater St. Louis V. M. A. Election Results

Leroy N. Atkinson, D.V.M., R.R. 13, Kirkwood, has been elected President of the Greater St. Louis Veterinary Medical Association, it was announced today. He succeeds C. R. Plegge, D.V.M.

The election took place at the annual meeting Friday evening, June 3. Also elected at the same meeting were: vice president — E. E. Epstein, D.V.M.; secretary — H. C. Eschenroeder, D.V.M.; treasurer — J. Seelbach, D.V.M.

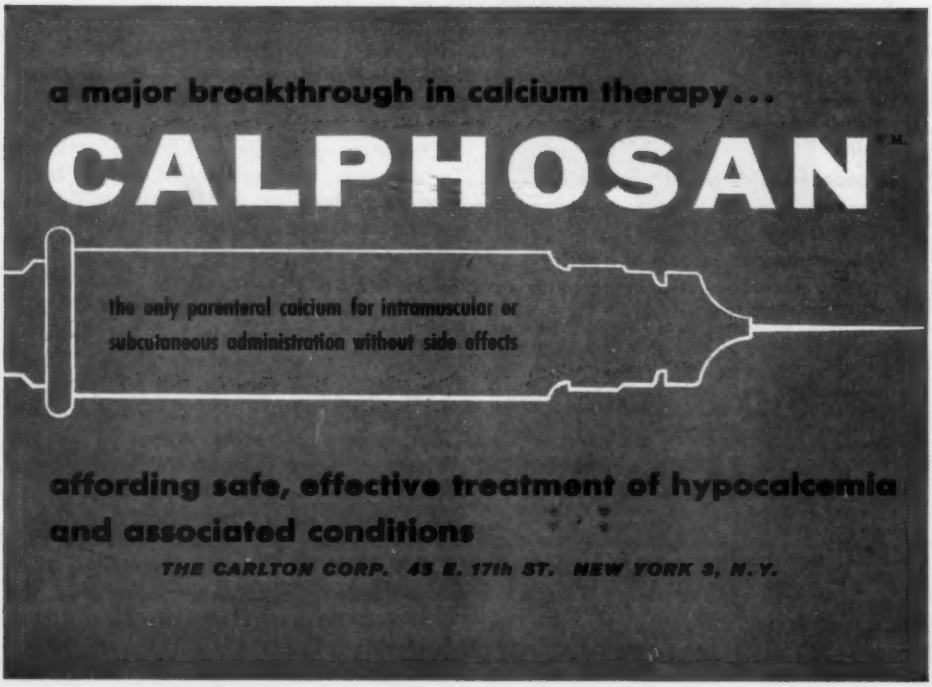
Dr. Bunde Named A Director at Allied Labs.

Dr. C. A. Bunde, a vice president of Pitman-Moore Company, has been placed in charge of medical affairs for the pharmaceutical firm and named scientific director of Allied Laboratories, Inc.

In his new capacity, Dr. Bunde is responsible for all medical and veterinary clinical research for the Indianapolis pharmaceutical firm in addition to serving as scientific advisor to the various subsidiaries of the parent company, Allied Laboratories, Inc.

Dr. Good Honored by Wyoming Stock Growers

Dr. G. H. Good, Cheyenne, Wyoming, was recently awarded an Honorary Life Membership in the Wyoming Stock Growers' Association. Dr. Good is state veterinarian and as part of his duties manages the brand office, as well as taking care of regulatory matters which bring him in frequent contact with the stockmen.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Veterinary Calendar

Sept. 12-17. **Conference of Public Health Veterinarians,** fifth biennial. Public Health Service, Communicable Disease Center, 50 Seventh Street, N.E., Atlanta, Georgia.

Sept. 14-15. **University of Minnesota,** postgraduate Conference for Veterinarians. Room 125, Veterinary Clinic Building, St. Paul Campus, St. Paul 1, Minnesota.

Sept. 14-16. **New York State Veterinary Medical Society,** annual meeting. Hotel Syracuse, Syracuse, N. Y. Joan S. Halat, ass't executive secretary, 803 Varick Street, Utica, N. Y.

Sept. 25. **American Veterinary Radiology Society,** annual Film Reading Session with speakers. 1:00 P.M., Hotel Elkhart, Elkhart, Indiana. J. J. Fishler, D.V.M., secretary, 3421 South Main Street, Elkhart, Indiana.

Sept. 25-26. **West Virginia Veterinary Medical Association,** annual meeting. Shenandoah Hotel, Martinsburg, West Va. Henry J. Fallon, secretary, 200 Fifth St. West, Huntington, West Va.

Oct. 6-7. **University of Illinois,** 41st Annual Conference and Extension Short Course for Veterinarians. College of Veterinary Medicine, Urbana, Illinois. L. E. Boley, chairman.

Oct. 12-14. **Purdue University,** 48th annual conference. School of Veterinary Medicine, Lafayette, Indiana. Erskine V. Morse, Dean.

Oct. 13-14. **Eastern Iowa Veterinary Association,** 47th Annual Meeting. Hotel Montrose, Cedar Rapids, Iowa. Grant B. Munger, D.V.M., Secretary, 1921 First Avenue, S.E., Cedar Rapids, Iowa.

Oct. 16-19. **New England Veterinary Medical Association,** 26th Annual Meeting. Sheraton Biltmore Hotel, Providence, Rhode Island. Warren J. Comstock, D.V.M., Clayville, Rhode Island.

Oct. 23-26. **The Southern Veterinary Medical Association,** annual meeting. Francis Marion Hotel, Charleston, S. C. Otto M. Storck, D.V.M., General Chairman, 461 Maybank Highway, Charleston, S. C.

Oct. 26-28. **American Cere Panel,** 11th annual meeting. Sheraton Jefferson Hotel, St. Louis, Missouri. Dr. Robert J. Flynn, secretary, Box 299, Lemont, Illinois.

Oct. 31, Nov. 1-2. **Association of Military Surgeons of the United States,** 67th annual convention. Mayflower Hotel, Washington, D. C. Rear Adm. Curtiss W. Schantz, general chairman, Asst. Chief of Bureau of Medicine & Surgery for Dentistry, Navy Department, Washington 25, D. C.

Nov. 7-8. **Missouri Veterinary Conference,** 36th annual. Columbia, Missouri. Cecil Elder, chairman.

Nov. 13-15. **Arizona Veterinary Medical Association,** annual meeting. Safari Hotel, Scottsdale, Arizona. Dr. Elmer B. Powell, 1102 S. Scottsdale Road, Scottsdale, Arizona.

Dec. 7-9. **Nebraska Veterinary Medical Association,** annual meeting. Hotel Cornhusker, Lincoln, Nebraska. Bob Garey, secretary.

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Capsule Review

Toxicologists rate the toxin produced by the *Clostridium botulinum* as the most potent of poisons—more so by far than animal venoms, diphtheria toxin, aconitine, etc. The tetanus toxin may possess about the same order of toxicity. The bacterium elaborating this toxin is a strict anaerobic, rod-shaped spore former; it does not grow in the bodies of warm blooded animals and, therefore, in general its toxicity is almost always as a sequel of food poisoning.

It is not known from the standpoint of the economy of the bacterium why the toxin is elaborated. There are at least five types of toxins, *i.e.*, A. B. C. D. & E. of the foregoing type. C and D have been alleged to cause a disease of grazing animals in South Africa, and type C apparently causes a disease condition in wild ducks and other birds in America. The A & B types cause botulism in man but not in animals.

The organisms live as saprophytes in decaying organic matter. The toxin causes disease when taken in by way of the mouth. Dogs and pigs are believed to be completely resistant, although there are reported cases in horses from the consumption of hay extensively contaminated with poultry feces.

"Loin disease" in cattle, which has been observed in Texas, has been said to be a botulism. One investigator has asserted that for botulism to take place in susceptible animals there must be a sequence of conditions, *i.e.*, phosphorus deficient food with a craving for it, usually in the form of bones and the presence of the specific organism usually in attached meat particles. If any of these are absent in animals, the disease does not develop. Pathologically, botulism in animals produces practically no lesions

BOTULISM

Even in the digestive tract there is no evidence of irritation even though the organism and its toxin remain there for some time. Since the toxin is one attacking the atonic nerve system—self-acting sensory nerves are not affected though motor nerves are—the symptoms in typical cases are paralyses of the organs supplied by the sympathetic system. More noticeable is paralysis of the muscles of mastication, deglutition and locomotion. Death in from a few hours to five or six days is the final result.

Vaccination after symptoms appear is practically valueless in animals since the toxin uptake is an irreversible one. In human beings it is said to be treated by psychotherapeutic measures. The possibility of neutralizing the toxin that has not escaped from the digestive tract into general circulation also provides an avenue for treatment. On the other hand the toxin is readily detoxified by means of formaldehyde without destroying antigenic properties. The resulting toxoid is nontoxic, highly immunologic and stable. For human beings a polyvalent preparation A, B, C, D, E is available.

It is conceded that on mink and fox farms these animals could inadvertently get spoiled meat. The use of the toxoid before the disease makes its appearance is a sound policy. In affected large and small animals, if there is no paralysis of the digestive tract, every attempt should be made to remove unabsorbed toxin by catharsis and enemas. Unaffected animals exposed to the same biological chain may be immunized with the toxoid. In spite of its low economic importance, botulism is still being intensively investigated.—*R. R. Dykstra, D.V.M.*

Research Reveals Highly Effective Anthelmintic for Cattle

The results of recently intensive clinical research revealed an anthelmintic that is highly effective in cattle. Individual animals were confined in special stalls and administered different phenothiazine drench formulations for testing. All urinary and fecal excreta were recovered and each excretion was individually analyzed chemically to determine how much of the dose went into the digestive tract and amount of the dose available for killing worms. Dosages were given on an identical basis.

Greater Concentration

Results obtained from the modified formulation were better than that of unmodified drenches generally used. Tests show that modified formulations made with Purified phenothiazine, micronized for maximum efficiency, produced 6 to 8 times more phenothiazine in the digestive tract in a shorter period of time than other drenches. Peak percentages of the purified chemical were obtained in 17 hours post treatment. The unmodified formulations returned a peak percentage of less than .2% 40 hours or later post treatment.

Other effective products are Pro-Brand Kabtin, a non-toxic demulcent for control of diarrhea from dietary or simple digestive causes; Pro-Brand KZ, antiseptic fungicide for ringworms and mycotic dermatoses; Pro-Brand Chap-Et a protective ointment for udders to reduce swelling and soreness. For details write to Pro-Brand Products Company, P. O. Box 4186, Fort Worth, Texas.

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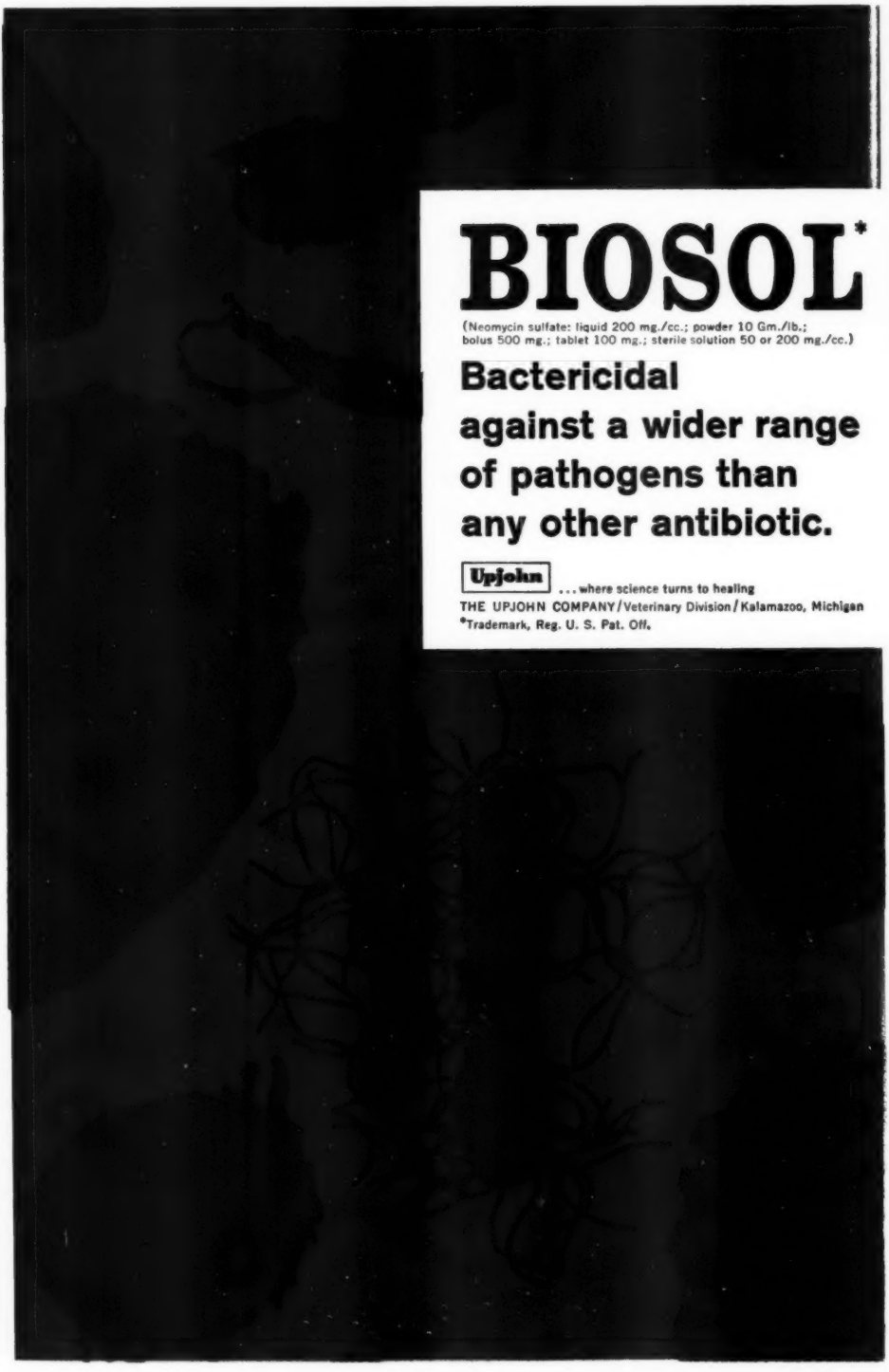
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Bactericidal against a wider range of pathogens than any other antibiotic.
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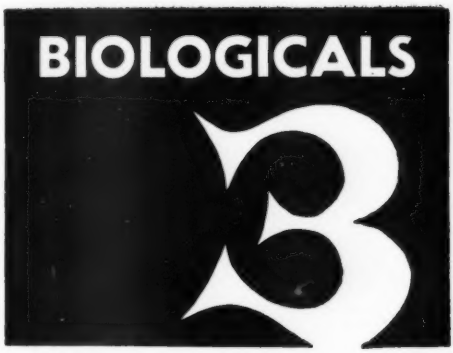
Take Time to Live

THERE IS AN EVER-GROWING INTEREST in the sport, hobby or economy (call it what you will) of handloading. In and out of gun circles, marathon griping sessions about having to pay $4.55 per box for .30/06 ammo have resulted in the sport of loading those shells for less than $1.50.

Assuming that you have your own shell cases, here's how the costs per round of .30/06 ammo stacks up.

Primer	1 cent
Bullet	5 cents
Powder	1 cent
TOTAL	7 cents

We're not overlooking the fact that handloading equipment costs quite a bit. One way to lessen the financial blow is to go in with a couple of hunting buddies on a cost-sharing basis, or if you want to assume the entire cost yourself, figure on doing a little handloading for your fellow nimrods and



sell the ammo to them at a saving, and a reasonable profit to yourself.

Handloading shotgun shells can also be economical, although the savings are not quite so sharp. Most shotgun handloaders do it for the consistency-of-load it affords.

Shotgun shells can be handloaded for around 6.8 cents per shell, but the case is only good for around three firings. Compare this to the average cost of high base shell — around 15 cents.

INJURED TEATS
SCAB TEATS
STENOSIS
POST-OPERATIVELY

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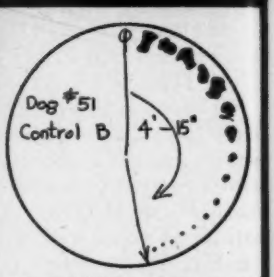
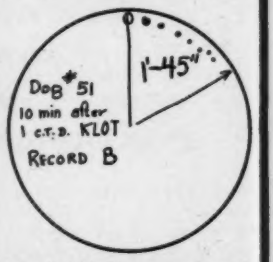
CONTROL HEMORRHAGE!

A clinical demonstration. Conditions: Standard lip injury with standard instrument. Wound blotted at 15 second intervals. Klot administered 1cc/10 lb. Identical procedure repeated using opposite lip.



Typical blotting paper record (15 sec. intervals). Bleeding time *without* KLOT — 4 min. 15 sec.



Typical blotting paper record (15 second intervals). Bleeding time 10 minutes after administration of one CTD* of KLOT — 1 min. 45 seconds — a 59% reduction.

Here's visible evidence that when hemorrhage is present, suspect, or anticipated, you can preserve vitality, prevent serious blood loss, save valuable time, with KLOT. It acts directly on the traumatized or pathologic tissue. Its antiheparin action affords excellent hemostatic effect in shock conditions. Safe for all animals —orally or parenterally.

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Dr. & Mrs. Guise Elected Presidents of Penn. V. M. A.

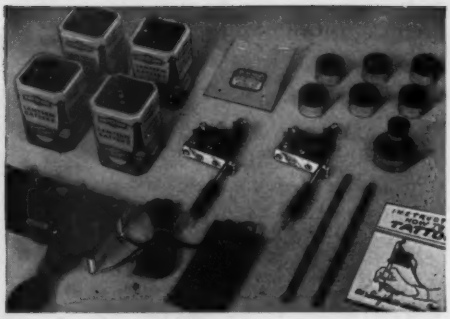
On July 14, at Erie, Pennsylvania, Dr. and Mrs. Richard C. Guise of Harrisburg received gavels as symbols of presidents of the Pennsylvania Veterinary Medical Association and the Auxiliary to the Pennsylvania Veterinary Medical Association. This is the first time in this organization that a husband and wife have assumed the duty during the same year.

Dr. Groves Promoted

Dr. L. W. Groves of American Cyanamid Company has been appointed promotion manager of animal industry products. Effective immediately, Dr. Groves is responsible for all advertising and promotional activities pertaining to animal feed, veterinary, and food products.

Dr. Groves joined American Cyanamid Company in 1953.

Before coming to Cyanamid, Dr. Groves taught and practiced veterinary medicine on the west coast. He received his D.V.M. degree in 1938 from the University of Toronto and a Master's degree in 1947 from Washington State University.



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Rabies Vaccination In Man

In the May 28, 1960 (page 333) issue of the Jour. of the Am. Med. Assn. Greenberg and Childress report on the "Vaccination (of humans) Against Rabies With Duck-Embryo and Semple Vaccines." One hundred twenty-three patients were given the multiple—13 to 14—injections of the duck embryo killed rabies vaccine, and 127 patients received brain-tissue (Semple) rabies vaccine. All the antirabies vaccine used in mass is dead vaccine. The duck-embryo vaccine is prepared by infecting embryonated duck eggs with fixed virus to which has been added 1:4000 betapropiolactone. The report indicates that the duck-embryo vaccine resulted in a somewhat earlier production of antibodies than the Semple vaccine, and the complicating encephalomyelitis did not occur where the duck-embryo vaccine was used, though following the use of the Semple vaccine it occurred in two patients. Booster doses of either of the two vaccines, given six to nine months after the beginning of treatment, resulted in titers higher than those following the primary injections. The authors complete the summary of their report as follows: "The earlier development of antibodies and the absence of the complications of encephalomyelitis after the use of duck-embryo vaccine suggest its use in the prophylaxis of rabies in preference to vaccines containing brain tissue."

Vitamin A Deficiency

The ability of rats to taste, as well as to see and smell, is inhibited by vitamin A deficiency. Dr. Eli Seifter and associates of Long Island Jewish Hospital, New Hyde Park, N. Y., believe, therefore, that the vitamin has some influence in all sense perception. White rats given a vitamin A-deficient ration cannot distinguish between plain tap water and sweetened or quinine water, but rats receiving a ration supplemented with vitamin A can.

Chem. & Eng. News 38:81, 1960.

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Geigy Appoints Dr. McCarty in Veterinary Research Post

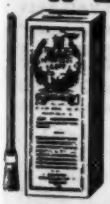
Dr. McCarty

Geigy Agricultural Chemicals, Division of Geigy Chemical Corporation, has announced the appointment of Dr. Robert T. McCarty as Staff Veterinarian in the Research Department.

Dr. McCarty will direct the veterinary product development program at Geigy and in addition will be responsible for liaison with clinics and schools of veterinary medicine in the United States.

Dr. McCarty obtained his D.V.M. degree from the School of Veterinary Medicine, Texas A. & M. College, in 1949. He comes to Geigy with several years experience in the commercial as well as clinical research fields. Dr. McCarty and his family will make their home near Ardsley, New York.

M·A·C



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DIABETIC DOGS FOR ETIOLOGY RESEARCH. Address: Charles S. Delahunt, D.V.M., Charles Pfizer & Co., Inc., Groton, Connecticut.

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GROSS OR SECTIONED BRAIN and spinal cord of parturient paresis cow; also milk sample from same. Dr. Unger, 1465 Broadway, New York City 36.

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GEM EAR CLAMPS (patented). Acclaimed by leading veterinarians. Precision instruments designed to eliminate guesswork in ear cropping. Assures beautiful ear trim. Circular on request. Joseph J. Cleary, Chance Run Kennels, Hanover, Mass.

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